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COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

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Back to the Mines!

TECHNICAL PROGRESS in coal mining in 1933 was overshadowed by intense executive preoccupation with the problems of code making. This is neither surprising nor alarming. With so many operators spending weeks and months at Washington and at home laboring with NRA and with their own associates to lay a new broad economic foundation for the industry, the real wonder is that as much was accomplished on the engineering side as the surveys of developments in this issue reveal.

Gratification over the measure of progress made under these unusual conditions, however, should not dull the realization that any slowing down in the rate of advance last year must be overcome by a quickening pace in 1934 if the industry is to build soundly on its new foundations. All that the codes can and should do is to prescribe the rules of the game and guarantee their observance. The race is still to the efficient swift.

Pursuit of any other theory of operation would be extremely ill-advised. While the present bituminous code outlaws ruinous price competition and vicious wage slashing, to look upon its price-fixing provisions as an umbrella to protect high-cost marginal production is to invite discontent within the industry and reprisals from without. The same tribunes who shed crocodilian tears over the fate of the small unit in industry deprived of wage-chiseling opportunities by NRA will acknowledge no inconsistency in denouncing price structures which permit inefficient units to survive.

Political, as well as economic, considerations dictate an unrelenting campaign upon the part of progressive management to reduce costs without impairing wage bases. The drive for lower costs and a more marketable product which has engaged the attention of leaders in the industry for the past decade must continue with undiminished vigor—but with all the emphasis now placed upon efficient management, modern methods and modern equipment. Washington is not the headquarters for planning this campaign; it must be done at the mines.

TVA Remembers

CRITICS of the industrial system which went into an eclipse in the fall of 1929 have been caustic in their condemnation of the planlessness of that system. Even many of those who believe in that system confessed, when the crash came, that social progress had not kept pace with engineering achievement. Now comes the Tennessee Valley Authority—one of the new federal agencies created by the administration which has taken "the forgotten man" to its bosom—with a plan for hydro-electric development and small-unit industrialization of the region which threatens the livelihood of many thousands of mine workers in Alabama, eastern Kentucky and Tennessee. The small-unit industrialization is still speculative; the hydro-electric development is actually under way. Apparently, TVA will remember the forgotten miners long enough to deprive them of their jobs.

For Table of Contents of this issue see page 86

In Union—

NO BETTER ILLUSTRATION of the inherent possibilities for genuine cooperation between capital and labor could be asked than the appearance of an officer of the National Coal Association before the biennial convention of the United Mine Workers to discuss the common stake management and men have in the future of the mining industry. Now, as never before, the two groups ought to present a united front, not against each other but against forces which would destroy them both. The presentation at Indianapolis and the joint action taken on proposals for a federal tax on natural gas are happy auguries that the declaration that the Appalachian wage agreement of last September marked "the beginning of a new era in the task of stabilizing and modernizing the economic processes" of the industry was more than an empty phrase.

Inter-Industry Competition

CONCRETE DISCUSSION of proposals to create a planning board for the fuel and energy industries, sponsored by W. H. Davis, Deputy Administrator of NRA, is one of the most hopeful developments that has yet come out of Washington. Urged early in the code deliberations of last summer and quietly ignored by NRA officials in their tentative drafts of bituminous codes, the need for coordination in the competitive alignments of coal, oil, gas and water power seemed doomed to non-recognition by governmental authority. Now, thanks to Mr. Davis' initiative, preliminary conferences to consider the scope and character of such a board already have been held.

Such a board, tying in not only NRA activities dealing with these rivals for the national energy market but also other federal agencies whose policies and decisions affect these activities, is vital if sane stabilization in the public interest is the goal of the national administration. As has been repeatedly pointed out in these columns, prompt establishment of proper competitive relationships is essential if the bituminous code approved by NRA is to be a shield instead of a hangman's noose to be tightened around the industry at the will or the whim of its competitors. This was made plain in the hearings on the code proposed by the natural-gas industry and in the presentation of the case for coal before the Petroleum Administrative Board.

More than this, however, is required if the country is to avoid large-scale repetition of the individualistic advances of the past which took no thought of how their reactions upon competing industries would affect the social fabric of the country. The natural desire of an industry or a group to maintain its present position or to move forward into greener fields must be weighed against the effects the fulfillment of such desire will have upon society as a whole. This does not mean that any industry or group has irrevocable rights to a market or that progress must or should be halted. But it does mean that sound planning will consider carefully whether the particular progress made is worth the price paid for it.

The resolution protesting against expenditures of government funds without such study adopted by the National Bituminous Coal Industrial Board at its meeting last month stated the case fairly and completely when it said that such projects should be considered from the standpoint of "the greatest permanent good to the largest number of our people." The planning board would assure such consideration.

Calorimetry Tells Only Part

GAS AND OIL burn at a temperature that it would appear should afford ample radiance, but temperature alone does not avail. The "black-body radiance" of the radiant body is the determining factor. There is all the difference in the world between the radiance of lead and hydrogen, even when the lead is at much the lower temperature. That is one reason why coal and ash radiate and gas and gasified oil give scarcely any radiance.

The rays from gas may be of the same quality as those from coal, but they may lack intensity and penetrative power. Inquiry in this direction might lead to a clearer understanding of the reason why savages threw stones in a wood fire to give it radiant qualities, and why our forefathers threw a pierced cannon ball into the wood fire, fished it out when hot and used it to give heat to the room that the fire itself could not afford. Better yet, it will explain why gas and oil, in practice, when used as sources of radiance, are found to give only a small percentage of the heat the chemists find when burning them in a calorimeter.

WIDE GAINS

+ In Fight for Stabilization

Marked Up by Coal

UNDER the protecting wings of the Blue Eagle, the bituminous industry ended 1933 with a large share of the objectives for which it has fought in recent years within its grasp. With wages stabilized by code prescription and agreement, prospects of a reasonable profit assured through price-control provisions, trade practices which have plagued the industry specifically outlawed and machinery for compelling the recalcitrant minority to abstain from practices inimical to the good of the industry established, soft coal entered 1934 with its plan for industrial control well in hand and operating with a substantial degree of success.

Chiefly responsible for these major strides toward rehabilitating an industry long sorely tried by internal strife growing out of declining demand and competition from outside fuels was the bituminous code of fair trade practices adopted under the provisions of the National Industrial Recovery Act. Within the limits of anti-trust legislation suspended in part by NIRA, previous efforts of the industry to achieve the two major and interdependent features of the code—establishment of "fair market prices" and wage levels assuring the miner a reasonable return for his labor—had culminated in the approval of Appalachian Coals, Inc., by the Supreme Court in March, 1933, after a vigorously waged campaign in support of the sales agency plan, followed by voluntary increases in wage levels in the Eastern and Southern fields. Passage of NIRA and the subsequent adoption of the bituminous code, however, broadened the power of the industry to cope with the destructive practices of the past and brought the federal government into the picture to give force to its decisions.

Along with relief from the demoralizing conditions of the older era, many not directly of its making, soft coal also received a lift in the form of a 5.9-per cent increase in production. Preliminary estimates by the U. S. Bureau of Mines place the 1933 bituminous output at 327,940,000 net tons, an increase of 18,230,000 tons over the 1932 total of 309,710,000 tons. This increase was due primarily to a rise in the production of pig iron, additions to commercial stocks and increased activity in the lake trade. Consumption by railroads and public utilities showed little change from 1932 figures, and this apparently was true of general industrial and domestic consumption also. The total burned by Class 1 carriers in road train and yard switching service, on the basis of figures for the first eleven months, stands approximately at the 1932 total of 66,133,000 tons, while public-utility consumption, according to preliminary figures, rose slightly to 30,582,327 tons, against 30,290,000 tons in 1932.

Pig-iron production increased to approximately 13,200,000 long tons in 1933, against 8,550,000 tons in the preceding year. Reflecting this increase, coal used in the manufacture of coke for blast-furnace use increased to approximately 19,000,000 tons, a rise of 52 per cent over the 1932 figure of 12,250,000 tons. Lake shipments also showed a substantial increase in 1933, total dumpings (cargo and fuel) aggregating 32,333,393 tons for the season, an increase of 7,160,182 tons, or 28.4 per cent, over the 1932 total of 25,173,211 tons. Dumpings last year also ran ahead of 1931, when the total was 31,387,405 tons.

Stocks of bituminous coal in the hands of industrial consumers on Jan. 1, 1934, totaled 25,614,000 tons, according to preliminary estimates by the U. S. Bureau of Mines, a decline from the Oct. 1, 1933, total of 26,495,000 tons, but an increase of 3,203,000 tons over the reserves of 22,411,000 tons on Jan. 1. Stocks in the hands of retail dealers showed little change, standing at 7,150,000 tons at the beginning of 1933 and 7,100,000 tons at the end. Stocks on docks at the Head of the Lakes at the end of 1933 were 6,579,000 tons, against 6,793,000 tons on Jan. 1.

The course of soft-coal prices during 1933 indicates a substantial increase in average realization for the country as a whole. As between districts, however, the trend of quotations varies, the rise being moderate in Illinois and slightly more in Indiana. In the East and South, however, particularly in the latter, December quotations ranged up to 200 per cent over prices prevailing in January, 1933, the maximum increases taking place on slack. These were in part a reflection of the wage increases made mandatory in the coal code and the Appalachian agreement, though a perceptible strengthening was apparent about the middle of the year, due to the operation of Appalachian Coals, Inc., and other sales agencies, as well as voluntary wage increases granted by operators in these regions.

The anthracite record in 1933, while not as favorable as that of soft coal, showed some evidences of improvement, the principal one being an almost complete cessation of the decline in output which has characterized operations since 1926. Total 1933 production is estimated by the U. S. Bureau of Mines at 49,399,000 net tons, a decline of 456,000 tons, or 0.9 per cent, from the 1932 total of 49,855,000 tons. Considering commercial tonnage alone, as distinguished from total output, including colliery fuel, the record was not quite so good, though the indicated decline apparently did not exceed 2.2 per cent. Much of the improvement in anthracite came in the last half of the year and was reflected in the reopening of nearly a score of operations, many of which had been down for years. Circular prices on anthracite were little changed from those established in 1932.

While passage of the National Industrial Recovery Act greatly broadened the opportunity for cooperative effort to eradicate destructive bituminous practices, operations under the act were foreshadowed by developments initiated by the industry itself and in cooperation with other natural-resources industries. One of the major results was the ap-

proval of Appalachian Coals, Inc., by the Supreme Court on March 13.

Sweeping aside previous condemnations of sales agreements among competing producers—notably in the *Addystone Pipe* and *Trenton Potteries* cases—as inapplicable, the court made three major points in its decision: Participants in the formation of Appalachian Coals, Inc., were engaged in a fair and open endeavor to aid the industry in a measurable recovery from its plight; price fixing by the agency was not contemplated or involved, though operation would tend to stabilize prices and raise them to a higher level. A change in market conditions growing out of attempts to correct abuses, however, should not condemn a cooperative effort for undue restraint of trade where such a group does not seek a monopoly; no ground existed for declaring the plan illegal because participants had not combined their properties and had chosen to maintain their independent plants with the object of facilitating, rather than limiting, production.

As a result of the decision, Appalachian Coals, Inc., started operations on April 17, and producers in other districts in the East, South, Southwest and Rocky Mountain regions revived plans for similar agencies. Of the various agencies under consideration, two—Northern Coals, Inc. (eastern Ohio) and Alabama Coals, Inc.—were reported to have reached the stage of actual operation. While organizations were completed for a number of other regions, actual operation was held up by the introduction of the NIRA in Congress in May. Introduction of this measure also halted the plans of anthracite and bituminous coal, oil, copper and lumber for legislation modeled after the Capper-Volstead Act, which exempts agriculture from the provisions of the Sherman Act to permit cooperative marketing.

Consideration of a bituminous code by a special committee of nineteen operators got under way substantially in advance of the passage of NIRA, which went into effect on June 16, and found the industry divided as to whether a general code to cover the entire industry should be offered or whether each district should be represented by its own code. Union operators, chiefly in the Middle West, were the chief proponents of the former plan, but were overruled by the then non-union operators in other parts of the country. As a result, even though one code was favored by the NRA, more than 30 separate measures had been tossed into the melting pot when hearings got under way on Aug. 9.

The hearings, however, proved to be only the curtain-raiser, and several weeks of negotiations, featured by clashes over the question of interpretation of Sec. 7(a) of the act, and also by the insistence of the NRA for a wage agreement in the Appalachian region to relieve it of the task of fixing wage differentials, followed before the final measure, effective Oct. 2, was signed by the President on Sept. 18. The stage for the adoption of the Appalachian agreement, which also went into effect on Oct. 2, had been set by a swift organization campaign by the United Mine Workers, which got under way as soon as it was apparent that NIRA would pass in substantially the form introduced. Through the Appalachian agreement and subsequent agreements negotiated as a result of the code (see pp. 65-68 of this issue of *Coal Age*) the United Mine Workers gained control of the majority of the mine workers in practically all of the major districts of the country, Alabama and the captive-mine operations of western Pennsylvania being the chief exceptions. The Progressive Miners of America, however, continued to challenge the sway of the United Mine Workers in Illinois, without, however, making much progress, in spite of a widespread campaign of terrorization.

Operation of the bituminous code immediately precipitated a fight between Illinois and Indiana over the question of price correlation, which later involved operators in the East. No settlement as between these States or between Eastern districts had been reached at the end of the year. Bringing truck and wagon mines under the code constituted another major problem, which was complicated by the lack of machinery for bringing about a solution. The same

lack of machinery also made it difficult to cope with the thorny problem of correlation of prices as between coal and its competitors.

Labor developments in the anthracite field were featured by the failure of the operators to obtain a wage reduction from the United Mine Workers and by the swift and spectacular rise of an insurgent union in the last half of the year. Negotiations for a wage cut were initiated by the hard-coal operators in 1932, and as a result of failure to agree the question was thrown into the hands of two arbitrators. These announced their failure to agree on March 1, 1933, and a second conference, which got under way on April 19, was terminated at the request of the Secretary of Labor until then pending legislation dealing with hours of labor and possible improvement of financial returns could be worked out.

Organized by insurgents and expelled members of the United Mine Workers, the United Anthracite Miners of Pennsylvania began operations in August by attempting to close down the mines of the Penn Anthracite Mining Co. and other collieries in the northern field, and followed up preliminary tests of strength by calling a general strike on Nov. 6, after several attempts to secure intervention by the National Labor Board. A truce was declared on Nov. 13, after the Labor Board had promised to investigate allegations of grievances, and a committee of three representatives was sent into the field to study the situation. A controversy over the question of reinstatement of strikers coupled with dissatisfaction with the progress of the investigation resulted in the calling of a second general strike on Jan. 15 of this year. This brought a proposal that the Anthracite Board of Conciliation arbitrate the controversy, which was opposed by the insurgents. A later decision to place the matter in the hands of James A. Gorman, umpire for the conciliation board, met with favor, however, and steps were taken to call off the strike.

Differences between the operators and representatives of the miners also featured the progress of hearings and subsequent negotiations on the anthracite code, which came up before the NRA on Nov. 17. The operators stood on the provisions of the wage agreement expiring in 1935, while representatives of the miners urged, among other things: equalization of working time; 6-hour day and 30-hour week; a minimum rate of $4.62 for outside labor; abolition of contract mining; and restriction of stripping, washery and culm-bank operation. Differences also developed among the operators over the sales price and policy clauses of the code, one group contending that the price-fixing provisions were unnecessary and that the purpose of these would be equally well served by an open-price system.

Competition from substitute fuels, already a major problem in the anthracite and bituminous industries, was thrown into even higher relief through code operation in the latter. While sales of domestic oil burners, it is estimated, dropped to 70,000 units in 1933, against 78,000 in the preceding year, and sales of distillate burners decreased from 280,000 to 230,000, the addition to existing facilities represents an additional shift of the heating load from coal and other fuels. Railroad consumption of fuel oil also dropped off in 1933 to 40,430,000 bbl. (estimated), a decrease

of 2.4 per cent from the 1932 total of 41,448,000 bbl. Coal consumption was approximately the same in both years. The drop in carrier consumption, however, was more than offset by the increase in fuel-oil use in the utility industry in the last half of 1933, which brought the total for the year up to 9,887,000 bbl., according to preliminary figures, an increase of 1,920,000 bbl., or 24.1 per cent, over the 1932 total of 7,967,000 bbl. Consumption of bituminous coal for this purpose, on the other hand, was only slightly higher.

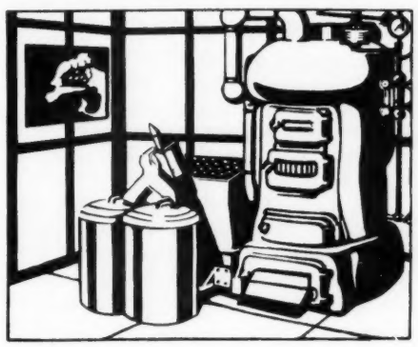
As in 1932, natural-gas activities were directed toward the development of additional markets for existing pipe lines, though exploitation of a number of new fields relatively near consuming markets also was a feature of activity last year. Michigan furnished a good example of the latter trend. Sales of natural gas, according to statistics covering the majority of the companies in the nine principal states, increased 2.6 per cent in 1933 on the basis of figures for eleven months. Comparative totals for the period are as follows: 1932, 741,179,200,000 cu.ft.; 1933, 760,198,200,000 cu.ft. The principal increase took place in industrial consumption, the total rising from 414,635,500,000 cu.ft. to 447,904,400,000 cu.ft. or 8 per cent. Sales to public utilities, however, dropped from 107,875,000,000 cu.ft. to 102,601,500,000 cu.ft., a decrease of 5.2 per cent, according to data gathered by the U. S. Geological Survey.

Sales of natural gas for domestic use (including house heating), according to the gas association, dropped from 241,319,000,000 cu.ft. in eleven months in 1932 to 229,077,400,000 cu.ft. in the same period in 1933, or 5.1 per cent, while commercial sales declined from 76,513,600,000 cu.ft. to 74,842,000,000 cu.ft., or 2.2 per cent.

Separate statistics on sales of manufactured and mixed gas by Illinois companies doing 98 per cent of the manufactured-gas business show a decrease of 2.8 per cent in the first eleven months of 1933, as compared with the same period in 1932. Actual volume decreased from 46,122,304,000 cu.ft. to 44,819,316,000 cu.ft. Sales for domestic purposes decreased 8.2 per cent (31,598,660,000 cu.ft. to 29,000,965,000 cu.ft.); house heating sales increased 22.4 per cent (3,262,349,000 cu.ft. to 3,993,514,000 cu.ft.); and industrial and commercial sales rose 4.6 per cent (11,182,435,000 cu.ft. to 11,695,560,000 cu.ft.). Total revenue for all sales dropped 7.5 per cent in 1933 (eleven months), apparently reflecting concessions in rates to secure business.

In addition to intensifying merchandising work, several other concrete steps were taken by anthracite and bituminous producers in 1933 to meet the competitive fuel situation. The high proportion of delivered prices absorbed by freight rates was the object of an attack by the bituminous industry, which joined with farmers' and manufacturers' associations in presenting a petition for a general reduction in freight rates on Jan. 25. This was denied by the Interstate Commerce Commission on Aug. 5. While no concerted action was taken by anthracite producers, the Delaware, Lackawanna & Western Coal Co. filed a petition on Jan. 28 for a general reduction in hard-coal freights to meet the competition of bituminous coal and substitute fuels. While hearings got under way early this year, no decision has yet been handed down.

The plans of the bituminous industry for a concerted research program to



broaden the market for soft coal came to fruition in April, when a charter was granted to Bituminous Coal Research, Inc., which has since been engaged in developing a program, though the work has been somewhat slowed down by preoccupation with code work. The anthracite industry, through the efforts of the Anthracite Institute and the Anthracite Institute Laboratory, supplemented by the programs of individual producers, continued its work on increasing the convenience of anthracite burning, as well as the task of comparing the various fuels, both solid and liquid, from the standpoint of efficiency, cleanliness and cost.

The seriousness of the question of competitive relationships between the fuel and power industries also produced its effect within NRA, which initiated a movement looking toward the establishment of a Fuel and Energy Planning Board to study the problem. Organization of the proposed board was the subject of attention by a special committee as the year ended.

Direct action against natural-gas competition was initiated by the soft-coal industry in November, 1933, when the National Coal Association got back of a proposal for federal legislation imposing a substantial tax on production. This move received the support of the United Mine Workers, and work on the proposed bill was in the hands of a committee of attorneys early in 1934. Supplementing the action of the National Coal Association, representatives of the Illinois Coal Operators' Association filed a formal request with the Illinois Commerce Commission early in December for an investigation into alleged illegal and discriminatory practices of the Peoples Gas Light & Coke Co., distributing Texas natural gas in the Chicago district. This petition also received the support of the United Mine Workers.

Reflecting both the work of the solid-fuel industries and the increased business activity in 1933, sales of all classes of stokers showed an increase in the last year, according to information supplied the Bureau of Census by 55 equipment manufacturers. The most striking gain took place in domestic stokers, which increased from 6,783 units in 1932 to 9,507 units last year. Commercial and industrial stokers also marked up substantial rises, as shown in the accompanying table.

Three-Year Record of Stoker Sales

	1931	1932	1933
Class 1[1]	6,915	6,783	9,507
Class 2[2]	1,520	916	958
Class 3[3]	1,223	585	951
Class 4[4]	2,463	1,287	1,545

[1]Residential (capacity, less than 100 lb. of coal per hour). [2]Apartment house and small commercial heating jobs (capacity, 100 to 200 lb. of coal per hour). [3]General commercial heating and small high-pressure steam plants (capacity, 200 to 300 lb. of coal per hour). [4]Large commercial and high-pressure steam plants (capacity, over 300 lb. of coal per hour).

The year 1933 also witnessed an increase in activity in the development of pulverized-coal burners for domestic use. Coal Jet, Inc., Columbus, Ohio, made a number of trial installations of its Coal Jet, five of which were in Cincinnati. Under the plan so far followed, the unit is leased to the user for an installation charge of approximately $10, plus a rental charge of $5 per month for eight months out of the year. The customer also agrees to purchase the necessary coal from the dealer installing the system. The price charged in Cincinnati is $11 per ton, which includes delivery in 50-lb. sacks and removal of the ashes by a vacuum unit. A similar unit is used in filling the customer's bin to pack the coal in and prevent any back pressure which might throw out a dust cloud.

After eight months of tests, the Peerless Coal Sales Co., Salt Lake City, Utah, headed by Ezra Thompson, vice-president, Peerless Coal Co., began preparations for marketing the "Centriflex" pulverizer and burner for domestic use in December of last year. Cost is reported to be less than $200 for a unit capable of heating a 12-room house and burning from 14 to 60 lb. of coal per hour. Weight of the burning unit is 85 lb., and it is equipped with two-point spark-plug ignition, stack temperature control and a General Electric thermostat.

ANTHRACITE

+ Drives for Lower Costs and Higher Quality

To Meet 1933 Market Conditions

WHILE a total production almost equal to the 1932 output was a favorable development in the anthracite industry last year, there was no recession in the drive for lower costs and better quality—two of the major weapons being employed by the industry in its fight to regain lost markets. The check in production was reflected in the reopening of nearly a score of operations, some of which had been closed down for years, while installation of mechanical-loading equipment furnished the principal gage of cost-cutting efforts. Preparation developments paralleled those in the bituminous industry in that attention was centered primarily on improving the smaller sizes, largely from the standpoint of lower ash and reduction of undersize and oversize.

The growth of mechanical loading in the hard-coal region in 1933 is indicated by the fact that between 280 and 290 conveyor units alone were purchased by anthracite companies, according to reports from manufacturers of that type of equipment. Of this total, between 240 and 250 were of the shaker type, the remainder being largely chain-and-flight machines, with some belt units included. As in other late years, the northern field, due to the fact that the pitch, with some exceptions, is not unduly great, was the scene of the greatest advance in mechanization.

One of the outstanding developments in this field was the opening of the new Harry Taylor mine, in the outskirts of Scranton, by the Penn Anthracite Mining Co. Operations at this mine are based on the use of belt conveyors for transportation and chain-and-flight conveyors with reversible shortwall cutting machines for gangway driving and chamber mining. In mining with machines, anthracite companies continued to adhere to the standard chamber and pillar methods in developing virgin coal, the several plans differing only in the number of chambers operated as a unit. One company continued its longwall work with shaker conveyors.

The number of chain-and-flight conveyors installed in 1933, while not large in comparison with the shaker total, represented a sizeable increase over 1932, due in part to the use of "elevating" types for working basins and other isolated areas lying below the major working sections. General practice in this case consists of driving a rock slope down to the basin, which is then developed with short chamber-type machines discharging either onto the elevating conveyor or an intermediate gathering unit. This system cuts down the amount of rock work that would be necessary in driving openings large enough to accommodate cars and also obviates the installation of track and hoisting equipment. A number of installations of this type went into service in the middle and southern fields in 1933.

The completion of pioneering work in the use of pit-car loaders in driving gangways was reflected in a material increase in the number of units installed for this purpose in the past year, particularly in thin coal, where handling rock is a major task. A few machines

of this type also are seeing service as elevators in connection with conveyor mining, taking the coal from the conveyors and elevating it into the mine car.

During the year, the Vulcan Iron Works brought out a new shaker conveyor, or "gangway loader," equipped with a combination drive and car spotter for facilitating the handling and loading of trips on the gangway. Twenty-seven of these units were purchased by the Hudson Coal Co. late in the year, it was reported. Development work also turned to operations at the face, the Goodman Mfg. Co. bringing out a new shaker conveyor loader with saw edges and removable side plates. In operation, the loader, with side plates removed as far back as is necessary, is advanced under the coal by a feeder head mounted on the inby end of the conveyor line, and is then pulled across the face with the cutting-machine rope. During this cycle, the loader is advanced or retracted, as necessary, by operating the feeder head.

While cutting machines in the anthracite region have been confined largely to mechanical-loading sections and other places where the pitch is not great, a longwall machine at the Salem Hill operation of the Haddock Mining Co., Pottsville, Pa., has been used successfully on pitches up to 40 deg. in connection with the longwall system in use at the mine. This machine (Sullivan CLE-6) is equipped with a 6-ft. cutter bar and operates at an average speed of 33 in. per minute on the maximum pitch.

Hydraulic backfilling operations at the Richmond No. 3 mine of the Scranton Coal Co., Scranton, described in the August, 1933, issue of *Coal Age*, pp. 255-258, ended the year with a total of approximately 150,000 cu.yd. of flushing material deposited and approximately 120,000 tons of coal or a little over half the expected total of 200,000 tons, recovered from pillars in the Clark and 14-foot beds in fifteen months of work. No sign of subsidence had appeared on the surface and the upper bed

mined at the operation had not been affected.

Stripping continued in all regions on the plane of activity established in 1932, one major development in stripping practice being the adoption of "wagon drills" by a number of contractors for comparatively shallow drilling. This equipment allows heavy tunneling-type pneumatic drills to be used in place of well drills. The drills are mounted on slides which operate in upright guides, and air is supplied by semi-portable compressors. The machines installed in 1933 were equipped with wheels and tow-bars for movement by tractor or similar equipment, but experimental work leading to the development of a self-propelling, tractor-mounted type was being carried on as the year ended.

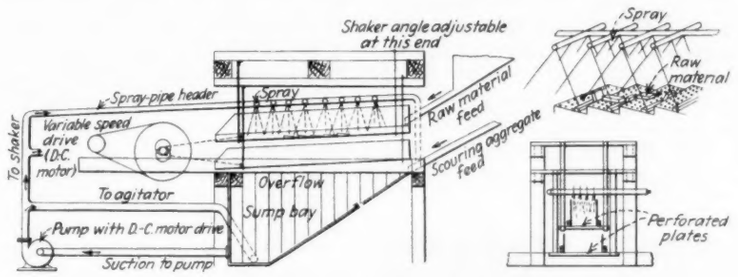
Maximum drilling depth ranges up to 30-35 ft. with this type of equipment, and while more holes must be put down than with well drills, the greater speed, according to users, results in equal or better performance. In addition, it is pointed out that better powder distribution results in greater fragmentation and also facilitates breaking out the toe of the face, thus easing the task of bringing down the overlying material. Reduction in operating labor and power or fuel costs also is cited.

Disposal of the overburden, an important consideration where casting often is impossible, was featured by an increase in the use of tractor wagons, tractor trucks and motor trucks equipped with tractor rear ends. Motor trucks were generally favored for moving coal, and larger stripping units (3- or 3½-cu.yd. dippers) were more frequent. Electrical operation of excavating units was preferred, especially the larger sizes.

A departure in transportation practice marked up for anthracite in 1933 was the selection of aluminized gunboats by Indian Head Anthracite, Inc., for use on the main slope at its new Indian Head colliery, Tremont, Pa. (described in *Coal Age*, December, 1933, pp. 397-404). These gunboats, manufactured by American Car & Foundry Co., have a capacity of 160 cu.ft. and are equipped with Timken-bearing wheels. Use of aluminum alloys reduced the weight to 4,950 lb., or 3,000 lb. under what corresponding equipment made entirely of steel would have totaled.

Developments in pumping practices and equipment at anthracite collieries in 1932 were marked by a continuation of the trend toward installation of automatic control equipment, which has demonstrated large savings at other operations in the past. This was a feature of a new major underground station built by the Hudson Coal Co. in the No. 2 Dunmore bed landing, No. 2 shaft, Marvine colliery, Scranton, for submerged operation, with controls and auxiliaries for either automatic or manual operation under either "suction head" or "suction lift." Major equipment includes two 14-in., 4-stage, 5,200-6,700-g.p.m. Barrett-Haentjens centrifugal pumps driven by 1,000-hp. across-the-line-starting General Electric motors.

The past year also witnessed the installation of a number of turbine-driven pumping units. Six were put in by the Lehigh Valley Coal Co. on the premise that where steam is available under proper conditions a material saving in cost over electric-motor drive is possible. The usual installation consists of a turbine (4,000-5,000 r.p.m.) and a spur-gear drive. The possible variation of 10 to 15 per cent in operating speed also may be an advantage at times, it is pointed out.



Scouring Machine for Discolored Coal

While the drive for lower ash in the steam sizes which featured anthracite preparation in 1933 was accompanied by experimental work on one or two new types of cleaning units, these had not reached the stage of commercial application at the end of the year and operators concentrated on the revision of flowsheets to incorporate existing types for this purpose. This revision was accompanied by an extension of the practice of re-treating refuse from the primary units used in making low-ash ne sizes to reduce coal loss, the coal ends from the re-treating units being returned to the breaker flow to find their way back to the primary units.

The growing importance of low-ash steam sizes was reflected also in the installation of new cleaning equipment. Analysis of capacity figures indicates that in addition to provisions naturally included in major new plants for handling the entire range of sizes, approximately 40 per cent of the new capacity was applied to buckwheat and smaller, with emphasis on the latter, as shown by the following installation record: East Bear Ridge Colliery Co., rice, barley and No. 4 buckwheat; Hazle Brook Coal Co. (Hazle Brook and Raven Run), buckwheat, rice, barley and No. 4; Green Ridge Coal Co., and the Philadelphia & Reading Coal & Iron Co. (Bear Valley), No. 4; Haddock Mining Co. (Candlemas), barley refuse; Jeddo-Highland Coal Co. and the Susquehanna Collieries Co. (Pennsylvania), barley; Pearl and Stevens Coal Companies, rice and barley; Pine Hill Coal Co., buckwheat. Types and capacities of equipment are given in the summary of new construction which appears on p. 61 of this issue. The Reading Company also installed two classifier units at its St. Nicholas central breaker to recover fines from the breaker wash water. Capacity of the two units is 7,000 g.p.m. per minute, carrying about 130 tons of solids per hour, of which about 65 tons per hour is recovered as feed to a fine-coal cleaning unit. The classifiers separate the 30- to 40-mesh material from the minus 3/32-in. fines, the larger size going to the cleaning unit.

Major construction in the anthracite region in 1933 included the installation of a headhouse and washery at the new Indian Head colliery, equipped with Rheolaveur coarse- and fine-coal washers, and the construction of a new Chance-equipped breaker at the Gowen colliery of the Buck Mountain Coal Mining Co., Fern Glen. The Indian Head plant includes provisions for recirculating material from the primary crushers, which are set to make not over 20 per cent of oversize, thus increasing the yield of prepared sizes and avoiding the difficulties growing out of adjustment of screens and roll settings when crushing to exact size in one pass is practiced.

The Gowen breaker replaces an old jig plant destroyed by fire early in 1933, and operation in the latter part of the year indicates substantial increases in yield of salable coal per mine car and prepared sizes, as well as reductions in labor, maintenance and power charges. Gowen also is the third in the list of Chance plants in which the rectangular-top cones usually employed for treating steam sizes are equipped with special provisions for cleaning No. 4 buckwheat along with the other sizes. Where this is done, the overflow from the coal discharge weir is split vertically into two layers. Most of the larger sizes (buckwheat, rice and barley) and a high proportion of sand are removed in the bottom split, while the top split contains a relatively large proportion of the finer coal and a relatively low proportion of the finer sand. The splits are discharged onto the desanding and sizing screens at separate points to facilitate separation of the sand from the finest material.

(Turn to page 50)

TECHNIQUE PROGRESSED

+ In Bituminous Mines During 1933

Despite Codes and Depression

THOUGH the past year was not productive of any major development in the bituminous regions, minor adaptations in all mines were changing technique for the better. True, code making absorbed the time of executives, and depression curtailed the expenditure of money. But, apparently, the ground was laid for new progress which in coming years may show up in its true perspective.

Two modifications of the duckbill have been developed, one in the East and the other at the mines of the Owl Creek Coal Co., Gebo, Wyo. At the latter, the rooms are driven straight up a pitch of about 22 deg. Shaker conveyors loaded by hand were first introduced, but later duckbills were added to gather the coal. They had a large capacity, being aided by the heavy pitch, but on such an inclination they were heavy and unwieldy and required skilled handling to prevent accidents. Care also had to be taken to avoid damaging the pans by collision of the duckbill with the face.

So P. H. Burnell, the superintendent, developed a loading head, the advance motion of which operates independently of the stroke of the conveyor. This head, which is provided with a ½-hp. motor through a worm-reduction gear, is advanced by screws on either side. At Gebo, an 8-in. stroke has proved to give the most desirable pan action. The Burnell head advances 1 in. at every stroke, and this small advance reduces the danger that the pans will buckle and break against the face. Seven of these loading units have been installed. At the mines of the Union Pacific Coal Co. mechanical loading has continued unchanged, the percentage of coal thus loaded in 1933 running close to that of 1932, which was 81.13.

In sinking an 800-ft. slope on a 20-deg. pitch at the mines of the Kemmerer Coal Co., Frontier, Wyo., and in turning four headings for an aggregate distance of 200 ft.—in all, 1,000 ft.—a slope-loading machine was used, operated by the rope on a hoist, the latter being located on the outside of the mine. This machine is now being used at Hanna, Wyo., in the mines of the Union Pacific Coal Co. The 1,000 ft. of narrow work was completed in 30 working days of 24 hours each.

At the strip pit of the Wyodak Coal & Manufacturing Co., Gillette, Wyo., (Coal Age, Vol. 33, pp. 673-675), the lignite bed is 100 ft. thick, and the cover

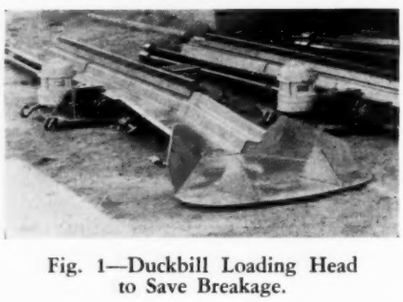


Fig. 1—Duckbill Loading Head to Save Breakage.

is at present about 35 ft. This cover used to be dislodged by directing against it a stream of water from a monitor. The material thus carried by the water was screened of all material above 2½ in., of which there was little, and delivered by a sand pump and pipe a quarter mile away to the old channel of Donkey Creek. This material was used also to form an embankment along the tipple track and around the tipple. However, as the distance increased and the material became harder, conveyors had to be introduced.

Fig. 2 shows the pit as it is at present, with the shovel and conveyors, by which the overburden is handled, in the distance. The conveyor at the bottom of the pit is used for coal only, as also the covered conveyor, which is seen at the left of the illustration. Fig. 3 indicates the method of handling the overburden, which is excavated by a Marion 1¼-yd. electric shovel, deposited in a Link-Belt portable hopper feeder and delivered to a 30-in. conveyor resting on the top of the coal seam. This carries material to the south bank, where it falls into another 30-in. conveyor running parallel to the side of the pit, which lifts it up an incline to the top of the bank to another conveyor with a belt tripper that dumps it over the side of the bank into the pit wherever desired. Between the coal conveyor and the south bank is sufficient space to retain all the overburden deposited. The conveyors are sufficiently far back from the edge of the pit for safety, and the deposit of débris covers up the lignite seam, protecting it against fire.

At the stripping of the Freemont Coal Co., Hopedale, Ohio, a subsidiary of the Tasa Coal Co., of Pittsburgh, Pa., the 66-in. No. 8, or Pittsburgh, seam has reached in one direction a cover of 40 or 50 ft., and will attain eventually a maximum of 80 ft.—altogether too great and too costly for shovel excavators to handle—so the coal is being mined by underground work. The first job will be driving a heading from the stripping face toward the tipple, a distance of about 700 ft., all the way to the dip, over a soft coal bottom and with a 12-in. slate band over the coal to add to the difficulty. As soon as this heading is completed the work to be done will all be to the rise. A McKinlay mining and loading machine is being used in the heading and will later be applied to the production of coal.

During the past year Joy saws have made much progress, twenty machines having been installed, thirteen being of floor type, six of track type and one of the 53-B type. Of the floor type, six are at the mine of the Black Star Coal Co., Alva, Ky., and six at that of the Pioneer Coal Co., Kettle Island, Ky. At the latter mine the production of 4-in. coal and over has increased from 35 to 66 per cent and the production of 2-in. nut and under has been reduced from 69 to 34 per cent. No drilling or shooting is required and no hydraulic breaker pad is used. The coal is removed by bars and broken up by hand picks and

without the withdrawal of a "key block."

At the Wheeling Township Coal Mining Co.'s mine, Adena, Ohio, a single track-type saw employed is working in coal 40 in. thick and too low for 5-B U Joy loaders. The seam consists of 8 in. of coal, 5 in. of laminated bone coal, 20 in. of coal, 1 in. of bone, and 6 in. of coal with a drawslate 13 in. thick, such as is common in this, the Pittsburgh No. 8, coal. The bottom is rolly. Rooms are driven 26 ft. wide, leaving 6-ft. pillars. The coal is sawed at top and bottom and sheared on each rib and sometimes sheared also in the middle. Light shots are fired. The size of the coal is somewhat larger than if the coal were undercut by shortwall cutters, but the seam presents such difficulties that comparison is not easy; it may be said, however, that the coal comes out in blocks, due to the cutting and the well-defined face and butt cleats.

At the mine of Pardee & Curtin Lumber Co., Bergoo, W. Va., the track-type saw installed will cut in both top and bottom coal. Here the percentage of lump will be a secondary consideration. The goal is to reduce the percentage of ash. Tests have been made with the Joy saw by the Chicago, Wilmington & Franklin Coal Co., Chicago, with good results; here hope is expressed that the saw idea will influence further cutting equipment.

More attention is being given to cutting bits. Among the many companies which have provided automatic devices and special baths that will avoid the hit-and-miss tempering of earlier days, are Walter Bledsoe & Co., Terre Haute, Ind.; the Pittsburgh Coal Co., Pittsburgh, Pa., and the Peabody Coal Co., Chicago. In the Southern fields, several companies are reported to be testing the new bits that are used till discarded, in place of bits that have to be sharpened and straightened between usings. Others are applying abrasives and hard alloys to the tips of standard types.

At the Boncar (W. Va.) mine of the Electro-Metallurgical Co., exhaustive tests are being made with Stellite, a product of that company's parent corporation. One wonders why the steel companies are not equally active in testing their product for arches, posts, crossbars and lagging. In Great Britain, the activity of the steel companies has brought about a veritable revolution in roof support. The steel companies should regard their mines as testing grounds with which they have been providentially equipped. Unfortunately, few manufacturing companies have such proving stations for the new equipment they devise or acquire.

In the Pocahontas field, new methods of cutting and breaking down the coal, suited to conditions at the particular mine to which they are applied, have been adopted. These have assisted the miners in removing impurities and reduced the load on the cleaning plants. The Pocahontas Fuel Co., Pocahontas, Va., is introducing cutting machines that will cut satisfactorily in any part of the seam. At the Rochester & Pittsburgh Coal Co.'s mines, Indiana, Pa., a double cutter bar is being used.

Attention is being paid also to the mechanics of drilling. The file as a means of sharpening bits is being discarded, as are most hand tools. At the Fairpoint mine of the Hanna Coal Co., a portable auger-sharpening tool is bolted to the truck bed of the drilling outfit. There is an emery wheel on each end of the motor shaft, one coarse and one fine. Augers thus ground can be tempered much harder and made tougher than is desirable with file sharpening. Thus the steel needs to be sharpened only one-fourth as often. In consequence, it lasts longer and give better service. The emery-wheel replacement costs are less than those of the hand file.

At No. 1 mine of the Bell & Zoller Coal & Mining Co., Ziegler, Ill., where Cardox is used exclusively, the bits of drills are now sharpened at five underground stations instead of at the blacksmith's shop. They are distributed by the main-line locomotives and gathering units. Strung on a wire with a brass check showing the number of the loading unit, they are not likely to be lost, and each crew is liable for the loss of its bits. Detachable bits for hammer drills are again receiving attention. The Timken Roller Bearing Co.'s bit rests on an upset shoulder and has a left-hand thread. Thus the entire force falls on the cutting edges. Electric-furnace steel is used for these bits. A bit made by the Ingersoll-Rand Co. screws on a shallow reverse buttress-type screw, the threads of which are said to receive none of the pressure. With the cadmium plating provided, the threads do not rust.

At least two mines in the Utah field are now using Cardox for shooting 100 per cent of their production, and others are using it for a large part of their tonnage. Near Price, Utah, on the Cat Canyon dome, is a well which produces carbon dioxide in large quantities, forming natural "dry ice." This is shipped in containers to the mines and is charged into cartridges for "shooting." This type of dislodgment produces, at these mines, coal with a minimum of crevicing, and the companies using this method are advertising the coal as being thus mined.

At the Royalton (Ill.) mine of the Franklin County Coal Co. between 40 and 50 per cent of the coal is being broken down by compressed-air cartridges. The seam is fairly level and about 8 ft. thick. It is mined by room-and-pillar methods with panels. The coal is undercut in the usual manner, and air bottles are placed in the drilled hole and tamped in the same manner as in shooting with permissible powder. The diameter of the bottles ranges between 3 and 5 in., but as yet no standard dimension has been adopted for all conditions. Lengths of these bottles also vary from 15 to 30 in., according to the nature of the work to be done.

A compressor furnishes the air to the bottle, which latter has a thin metal disk at one end which breaks down when a rupturing pressure of about 5,500 lb. per square inch is reached. The escape of the air into the hole subjects the coal to a heavy bursting pressure and breaks it down with minimum fracture. The coal is snubbed by placing one or two small charges in the lower part of the seam, and this is followed by drilling two or three holes in the body of the coal, depending on the

Fig. 2—Strip Pit at Wyodak, Wyo.

work to be done, the width of the faces ranging from 15 ft. in the headings to a maximum of 30 ft. in the rooms.

Present experience indicates a reduction in 2-in. slack of 20 to 25 per cent and a corresponding increase in 2-in. lump. Plans are laid to equip the mine completely for dislodging, by this method, all the coal mined. To transfer the compressor from place to place, it is loaded on a special truck and hauled by a locomotive. The bottles are never projected from the holes when a discharge takes place.

A new cartridge has been devised by the Atlas Powder Co., to contain not explosive but a length of shooting wire, which is wrapped around an electric blasting cap with an accordion fold so that the cap is protected on all sides and ends. When the cap is needed for use, the cartridge is broken in the center and the wires are released in such form that they are readily extended. A new all-metal delay electric blasting cap, with firing and delay elements that produce practically no gas, has been produced by the Hercules Powder Co. Thus it has been possible to use a solid one-piece shell without a gas vent, through which moisture might enter to cause misfires.

Emphasis is being laid on transportation as distances get greater and concentration of mining operations increases. With fewer, though longer, roads to be maintained, companies can afford to have well-maintained tracks, and indeed are compelled to provide them. Better roads are reported from various parts of the country; the Pocahontas Fuel Co., in particular, steel-timbering its main haulageways in 1933 and laying many miles of 85-lb. steel, with the idea of preparing for renewed activity later, but also to provide work for men for whom it would be otherwise unable to provide.

Steel ties for main and room-heading haulage have made some progress, one company, which uses 40- to 50-lb. rail on main haulage, having installed 15,200 of 40- to 50-lb. channel straight-end West Virginia and Carnegie steel ties; most of these are interspersed with wood ties, but, in all, about 1½ miles of road rests entirely on steel ties. On the room headings of this company, 13,500 ties are of steel. This corporation uses steel ties because of their long life and because they hold the track accurately to gage. Another company is using 750 Carnegie steel ties at 6-ft. centers on the main slope to keep the 60-lb. rails to gage. The rail is further supported by 6x8-in. wood ties. A third company is using Carnegie steel ties in place of every third or fourth 6x8-in. wood tie on its main haulage and room headings for the purpose of maintaining the gage. None of these companies are affiliates of steel corporations and their installations are, therefore, not in the nature of tests for marketing purposes,

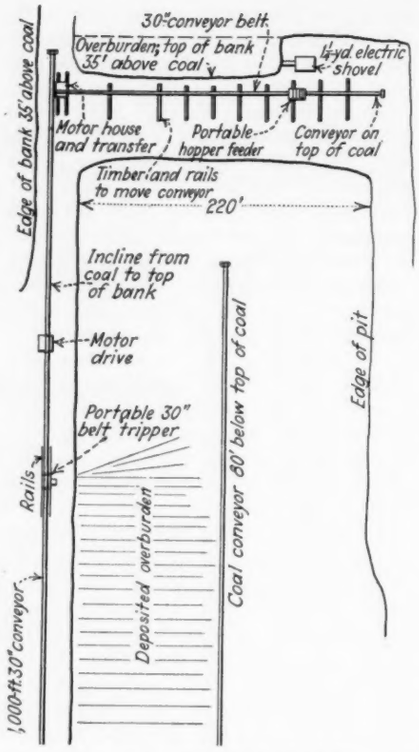


Fig. 3—Plan Showing Method of Disposal of Stripping Spoil at Wyodak.

such as have been advocated earlier in this article.

Steel ties are becoming standard in rooms, being used not only by companies with thin coal but by those who value them for their long life, lightness, convenience, ease in laying, trueness to gage and because they lower the height to which the miner has to raise his coal in shoveling. The need for better ties is quite generally recognized, a number of companies using treated wood ties in order to reduce replacement costs. Any long view of mine operation makes the use of steel or treated wood ties obligatory.

The tendency with heavier locomotives, machines and cars, and greater speeds is toward heavier rails. Mine-haulage locomotives are being weighted down to increase their tractive power, and some are having their gear ratios changed to afford greater speed. This larger service imperils the life of armatures from heating, so forced ventilation is being installed in such locomotives to assure them against increase of temperature.

With this comes better ballasting and road drainage, larger trolley and feed lines. One company in southern West Virginia has just placed an order for a locomotive with all the latest improvements—anti-friction bearings throughout, air brakes, air-cooled motors and air-cooled resistances, a cleaning hose attachment for blowing dust from the locomotive equipment and other of the newest developments. In West Virginia generally, main haulage speeds are increasing, locomotives being built with that end in view, but the speeds of gathering locomotives are being lowered to obtain greater economy by removing the need for the use of resistance on favoring gradients.

Maintenance costs on mine-locomotive bearings have been reduced by the application of heavy-duty cylindrical roller bearings at the pinion ends of the motors of such locomotives. By mounting both inner and outer rings of the roller bearing with interference fits on the shaft and in the housing, looseness is eliminated. Many operators have found it of advantage to provide more effective means for keeping out coal dust and other foreign material, such as is afforded by the labyrinth seal. This extends the life of the bearing, it is said, to more than three years.

Recently the Carter Coal Co. resumed control of the "wireless" battery-equipped mines in McDowell County, W. Va., and this company apparently expects to continue to run its mines wirelessly, for in the past year it purchased eleven carloads of Exide Ironclad batteries for use in its power tanks and locomotives.

Bonding of rails for haulage continues to be a lively subject. Some are welding the rails together and some are returning to short 8-in. bonds, which were first used in the latter end of the first decade of this century. These short bonds sometimes failed because the tracks were not supported properly at the joints and because the wheels of locomotives had false flanges which cut or knocked off the bonds, so a good bond was rejected to meet a bad condition which should have been corrected. Now, with better tracks and better wheels, what looked like a poor bonding arrangement is coming back into favor.

Some companies are welding these bonds to the ball and some to the base of the rail, the space on the latter being made available by using a splice bar instead of an angle bar where the bond is located. The shorter bond lowers resistance and the high current capacity is increased by the cooling effect of the rail at the terminals. Moreover, the cost is less.

Preference seems to be growing for the use of rolled-steel wheels on locomotives in place of cast-iron cores with steel tires; this applies, of course, only to the larger mines which are equipped with wheel presses.

Bigger and better cars are being introduced wherever funds are available. The Peabody Coal Co. at its two Springfield operations have doubled the size of the cars used. Roller- and ball-bearing wheels are being found not only an economy in haulage and lubrication but a necessity for high-speed travel. The Leckie Fire Creek Coal Co. has installed 100 American Car & Foundry four-axle mine cars, and the Raines Lumber and Coal, 50 of the same type.

At Maidsville, W. Va., the Kelly's Creek Colliery Co. introduced a new type of Watt car with Timken bearings, Miner spring-draft gears and Cop-R-loy steel plates. With this car, capacity was increased by 46 cu. ft. without increasing any of the over-all dimensions, except that length was increased 12 in. The modern car conducts itself well in emergencies. Several of these Maidsville cars ran away and collided with a haulage locomotive without damage to themselves, but with disastrous effect to the bumper of the locomotive. Even a roof fall did little damage.

Cars are now being installed modeled over those used on the railroads in so far as making floor plate, pedestals and draft housing in a single piece is concerned. These cars, manufactured by the General Steel Castings Corporation, are capacious and are said not to lose their alignment under all the vicissitudes of life on the rail. The warped car, with its frequent derailments, seems likely, with all the improvements recently introduced, to be a reminiscence of the past. Present road speeds will not tolerate it.

At the mines of the Rochester & Pittsburgh Coal Co. about 1,000 American Car & Foundry welded steel cars have been introduced; not all, however, in 1933. The plates of these cars, having welded seams, are devoid of rivets, which are likely to become loose in wear. The seams, being tight, do not admit acid water and consequently rust at the seams is avoided. The cars are coated with aluminum paint as a further protection against rust.

With changes in the size of cars come heavier cages to raise them and enlargements of shafts to permit the hoisting of such equipment. Fortunately, shafts in this country are not deep, and reconstruction pays in better ventilation, and sometimes is necessary because of shaft conditions. At two mines in the Springfield district, the Peabody Coal Co., which was doubling the size of its cars, increased the size of its main hoisting shafts also.

Mine water becomes less acid if it is kept free from oxygen and from steam. With the electric pump replacing the steam pumps at the shaft sump, there is no need to exhaust steam into the impounded water, but it has been found that neither is there much need anywhere to have the sump in live air. Shutting off the ventilation soon makes the air inert—a mixture of nitrogen, carbon dioxide and perhaps, unfortunately, methane—and, with this kind of atmosphere, the water will become noncorrosive, increasing pump and column life. Many companies in Pennsylvania have been urged by the State Drainage Board to make this provision, and, being inexpensive, it has reduced costs; but in mines making methane some danger is involved, for, while the methane may be inexplosive in the sump atmosphere, it may become explosive if caused by a fall to enter the ventilated workings, or if the sump is reventilated by the fall of stoppings or the opening of airways.

In the southern West Virginia region, the Pocahontas Fuel Co. is working on an extensive drainage project, which when completed will be over twenty miles long and will drain a large part of the coal measures on its property. Use of turbine-type deep-well pumps with a driving motor on the surface is increasing. One large company in the New River field installed two such pumps in 1933.

Several Aerovanes have been installed in the bituminous coal field, among others one in the Carney seam at the Acme mine of the Sheridan-Wyoming Coal Co., Acme, Wyo., and one at No. 31 mine of the Pocahontas Fuel Co., in West Virginia. At the mines of Pennsylvania Coal & Coke Co., J. F. MacWilliams, electrical engineer, has rebuilt a 6x2½-ft. fan, which, thus far, has not been put into operation because the mine is not ready. This fan has inlet tubes to admit air with minimum resistance, an évasé chimney, in accord with Prof. Briggs' specifications, no bearings in the airway to interfere with the flow of air, and a taper shaft with barrel roller bearings. Rough checks have been taken through certain resistances, which show that it will pass 61,750 cu.ft. of air, with a drop of 1 in. in water gage when the fan is revolved at 200 r.p.m. by an induction motor with a belt drive. Under these conditions, it requires 14.4 kw. of current. Passing 24,050 cu.ft. with a resistance of 1.4 in., 8.6 kw. was required. The use of the electric eye for opening two ventilation doors to a neutral area at the mine of the Buckeye Coal Co., at Nemacolin, Pa., has aroused much interest.

At Mather Collieries, Mather, Pa., and at the Kramer mine of the Northwestern Mining & Exchange Co., Du Bois, Pa., installations of the latest Wheat lamps with automatic locks were made last year. The lamps are charged by the constant-potential method, and each compartment of the rack is assembled with an indicating meter. The combination of the constant-potential current, indicating meter and automatic lock, assembled in the headpiece, makes possible self, or, as it is styled, "cafeteria," lamphouse service, saving the lampman much work and permitting the miner to place his own lamp on charge and take it off charge without using any keys or magneto, for the lamp does not have to be taken apart and the charging contacts are so controlled by the automatic lock that they become alive when the lamp is placed on the rack and become dead when the lamp is taken off.

A fully automatic Interstate continuous carrier system of telpherage was installed at the mine of the Anchor Coal Co., Highcoal, W. Va., early in the fall of 1933. This is approximately 1,700 ft. long and has a fall between terminals of 300 ft. It develops 25 hp. under full load and will carry 1,000 tons of mine-run per day.

Refuse disposal continues to be a trying problem at many coal mines. The dumping of coal is a simple matter, for the coal is carried away by cars, and the handling of it on receipt is a problem for the consumer, whereas refuse piles up and soon chokes the point of discharge, so that a new dumping point has to be provided. The Fordson Coal Co.'s arrangement for dumping refuse, recently completed, combines a Hanson automatic aerial tramway to raise the rock 200 ft. and carry it away from the tipple 680 ft., and a refuse car on a tramway, which transports the rock thus delivered around a hill for dumping either side or endwise. The rock first drops into a 1,000-ton storage bin having a reciprocating feeder which dumps into a batcher until it is filled to a predetermined weight. Then the feeder stops and the batcher gate opens and discharges into one of two buckets of the aerial tramway, which proceeds along the tramway to the storage bin on the hill. Meantime the other bucket arrives and is filled automatically. The Interstate Equipment Corporation, by improved design of supporting tower structures and by means of supporting track cables at intermediate towers with a new type of traction rope-driven wheel, has increased the operating speed of its equipment from 900 to 1,300 or 1,400 ft. per minute.

At the mines of the Union Coal Co., Peru, Ill., a Brookville 2½-ton gasoline locomotive is used to haul refuse in two cars, each weighing about a ton, for a distance of about ¼ mile up a 4-per cent gradient to the end of the dump, the gradient being introduced to increase

the height of the dump and increase the dumping area.

Both the Union Pacific Coal Co. and the Colony Coal Co., with mines in southwestern Wyoming, equipped their employees above and below ground with protective goggles of the super-armor-plate type, and arranged to provide men suffering from defective eyesight with goggles corrected for such defects. Many of the men furnished with corrective lens goggles learned, for the first time, the benefit and safety that could be thus afforded. The first company has not had a single eye accident since April 24, when a foreman who was awaiting the arrival of his protective glasses received an injury to one of his eyes.

Some of the mines of the Pocahontas Coal & Coke Co. and one at least in the State of Indiana have been double-shifted, and one mine in Pennsylvania, having a capacity far exceeding its present needs, has been working its various mining, transporting and other facilities on a schedule such as distributes the electric load throughout the day, thus reducing its power bill.

Mechanization is displacing the convenient horse around the tipple. For shifting carloads of supplies between storage and shaft, the Harwick Coal & Coke Co., Harwick, Pa., has installed a 3½-ton Brookville gasoline locomotive. The haulage is light, the gradients are easy and the distance traversed in a single trip is seldom over 200 ft. A number of scales have been installed in those regions where measurement was formerly by the car. Such changes have been made to comply with the provisions of the bituminous code specifying that piecework rates shall be on a tonnage basis.

Finally, reference should be made to roof support. One steel company has given consideration to the use of tubular supports at its mines, believing a saving might thereby be made. In the mines of Maryland, full-arch steel timbering is being used, apparently not unlike that favored in Great Britain, only a T-shaped section is being used instead of an I-section for the arch and 3-in. channel sections are used for the verticals. Both the limbs of the T are ⅞ in. thick. The height of the arch is 6 ft. 9 in., and the exterior width 8 ft. The channel sections rest on bottom rock; the sets are placed at about 3-ft. centers and are lagged with 1¼x8-in. wood lagging, which preferably is treated with creosote before being used. This "full-arch" section is appropriately termed the "covered-wagon" support, the sets being almost of the shape of the hoops once used by "prairie schooners" for carrying the canvas by which their wagons were covered. Some places are timbered with 8-in. I-beams resting on yellow-locust legs.

In stripping, one of the big developments has been the introduction of the horizontal drill, which wipes out the expense incident to the use of water, enables the hole to be drilled in favorable material, avoids the possibility that an unbroken toe will be left at the base of the "high wall," shoots the wall up, instead of into, the strip pit and permits the drill to be placed on ground ideally suited for it.

A stripping with unusually large equipment was started by the Midland Electric Coal Corporation at Middle Grove, near Peoria, Ill. The strip shovel has a 20-cu.yd. bucket, and the coal-loading shovel, one of 5 cu. ft. At present the cover is being removed without explosives, the hard material being so thin as to break when the heavy shovel applies pressure to it and the soft measures making so little resistance that they do not reinforce the hard. Explosives, however, may have to be used later.

In short, the year 1933, if not a year of activity and achievement, was certainly one of significance and promise.

Anthracite Drives for Lower Costs And Higher Quality

(Concluded from page 45)

Another new development in the anthracite region in 1933 was the introduction of a process for scouring coal to remove discoloration, patented by Truman M. Dodson, vice-president, Weston, Dodson & Co., Inc. Development of the machine, shown in the accompanying illustration, was the result of experimental work with a number of processes. It consists essentially of a small step shaker with a 12-in. tread and 3-in. riser mounted on a 3 in 12 pitch, which is adjustable. The shaker is driven at approximately 240 r.p.m., and the discolored coal is sprayed with ordinary breaker water in which is mixed up to 20-24 per cent of culm dirt (No. 4 buckwheat). The treating fluid is circulated under a pressure of 40 to 60 lb. per square inch by a centrifugal pump. A small trip is installed just below each riser to turn the coal over so that all sides are exposed to the spray.

Length of the unit now operating is 11 ft., and the width can be anything from 2 to 4 ft. Capacity at a width of 4 ft., runs up to 30-40 tons per hour. Operating cost, it is reported, consists almost entirely of the charge for power, which averages 4 to 5c. per ton, to which must be added about 1c. for maintenance and repairs. Individual attention is not required, and therefore there is no direct labor charge.

As the aggregate, or culm, disintegrates in the processing, it must be replaced and make-up water added from time to time. This is accomplished by an overflow, the rate of discharge of which is known and from which, therefore, the average requirements in terms of make-up water and aggregate can be determined. Experience has shown that different types of discoloration require changes in scouring, due to the fact that excessive travel under the sprays tends to destroy the luster. Adjustments to take care of this contingency consist of installing valves on the sprays nearest the discharge end of the shaker, increasing or decreasing spray pressure and increasing or decreasing the percentage of aggregate.

In connection with breaker maintenance, investigations were carried on in several quarters into wear on chain-and-flight conveyors. While not yet completed, studies dealing with wearing plates for conveyor troughs and also with chains indicate that when a certain Brinell hardness is exceeded, life is materially reduced. Galvanizing pins also was tried in one instance, and preliminary experience apparently shows a much longer life.

Maintenance and attendance requirements accompanying the use of chain-and-flight conveyors also was a factor in the selection of main and shuttle belts in the refuse-disposal modernization program of the Hudson Coal Co., which completed its third installation of this type of equipment at Olyphant colliery late in 1933 (January *Coal Age*, pp. 6-8). Up to Nov. 30, 1933, the Marvine installation—the first—had handled 480,000 tons of material in 746 starts with a normal operating force of one man; Pine Ridge, 330,000 tons of rock and 6,000 tons of ashes in 306 starts with a two-man crew; Olyphant, approximately 300,000 tons with two men normally assigned to this duty.

ACCIDENT PREVENTION

+ Makes New Record in 1933

By SCOTT TURNER
Director, U. S. Bureau of Mines

TWO remarkable achievements in accident prevention were the outstanding features in coal mining in 1933. The first was the establishment of an all-time record in lowering the fatality rate per million tons of coal produced; the second was holding major disasters to one—the best record of the kind since 1880.

The exact fatality rate per million man-hours of exposure will not be known until late in 1934, after detailed reports are received showing the number of men employed at the mines in 1933. However, if productivity per man-hour of work in 1932 may serve as a guide in estimating the amount of work done in 1933, the fatality rate per million man-hours of exposure in the latter year also represented an improvement.

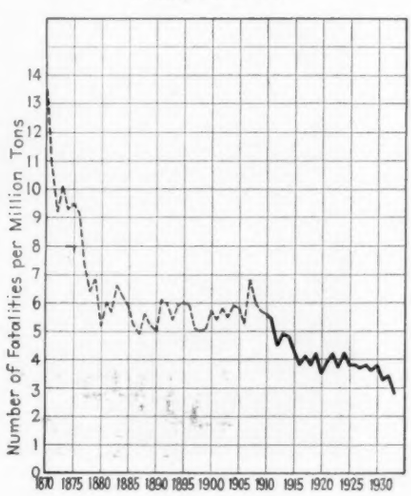
Like other commodities, a ton of coal has a price paid in limbs and lives of men engaged in producing it. Coal is not unique in this respect; it is mentioned in this connection only because it is a commodity in which the readers of *Coal Age* are directly interested. Production of coal last year approximated 377,300,000 tons, of which 327,900,000 tons was bituminous and 49,400,000 tons anthracite. Each million tons of this combined output represented a loss of life now estimated at 2.83. Final reports may necessitate some revision in this figure, but it is believed that whatever change may become necessary will lower rather than raise the above rate.

Never before, in the 64 years for which accident records are available, has coal been mined in the United States at as low a cost as three lives per million tons. The rate of 2.83 for 1933 therefore sets a new mark for safety in the industry. The nearest approach to this record was in 1931, when the rate was 3.31; in 1932 it was 3.36; hence, coal mining has had three recent record-breaking safety years to its credit. The tentative rate for bituminous mines alone is 2.51 fatalities per million tons, compared with 3.09 for the previous year; the anthracite rate, according to present estimates, was 4.93, the corresponding rate for the previous year being 4.99.

These figures indicate that 1933 was a phenomenally safe year, not only for the entire coal industry but for anthracite and bituminous mines considered as separate classes.

A brief comparison of the industry's fatality rate per million tons in 1933 with similar rates for earlier years will emphasize the excellence of last year's record. The earliest year for which relatively accurate figures are available was 1870; data for that year relate only to anthracite mines in Pennsylvania, where the disastrous fire in the Avondale mine, costing 179 lives, occurred in 1869. As represented by anthracite mines only, the fatality rate for 1870 was 13.47 per million tons. In 1873 the rate was 10.06, also for anthracite mines only. By 1883 figures had become available for several bituminous-coal-mining States, and, in association with anthracite and bituminous mines in Pennsylvania, they had a combined rate of 6.58 fatalities per million tons of coal mined. Ten years later (1893) the rate was 5.39, and in 1903 it was 5.47. In 1913 the rate had been lowered to 4.89. Ten years ago (1923), 3.74 lives were lost for each million tons of coal produced.

Coal-Mine Fatality Rates Per Million Tons of Coal Produced in the United States, 1870-1933



This progress is indicated graphically in an accompanying chart. The curve in the chart shows the per-million-ton death rates as recorded; but, to avoid confusion, it should be emphasized that the portion of the curve relating to the years 1870-73 covers anthracite mines only; after 1873, the curve relates to mines in an increasing number of States, as additional States began to keep official records of coal-mine fatalities. From 1910 to 1933, the curve covers mines in all coal-producing States.

This graph traces progress in lowering the life-cost of coal. The advance in safety from 1870 to 1909 is indicated plainly by the downward trend of the accident curve. More significant, however, is the improvement since 1909, because that part of the curve which applies to the years 1910 to 1933 covers the entire coal-mining industry and yet indicates a gratifying reduction in the fatality rate per million tons. From 1870 to 1909, progress probably was less than the graph suggests, because in the earlier years the curve largely reflects the experience of the anthracite-mining industry, in which accident rates per million tons are normally higher than the corresponding rates for the bituminous industry.

Falls of roof and coal continue to cause the greatest number of accidents to men employed in coal mines in the United States and other countries. Accidents attributable thereto accounted for 57 per cent of the total number of fatalities in 1933, instead of about 50 per cent, the average from 1923 to 1932; the higher percentage of roof-fall fatalities is due to the sharp drop in the percentage of fatalities from explosions. Eighteen per cent of the fatalities were due to haulage accidents underground, 4.1 per cent to explosions of gas and dust, 2.8 per cent to explosives, 5.8 per cent to electricity, 1.6 per cent to mining machines and other me-

Bureau of Mines Photo

A Properly Rock-Dusted Haulageway.

chanical equipment underground, and 2.4 per cent to miscellaneous causes in the mines. Shaft accidents caused only 1 per cent of the total fatalities, and 7 per cent were due to various causes at surface shops and yards.

As might be expected, most of the roof falls occurred while the men were mining or loading coal. The most common haulage accidents were those in which the injured employees were struck or run over by mine cars, although in numerous instances employees were killed by being squeezed against rib or timber. Electric arcs were a prolific cause of ignitions that initiated gas or dust explosions. The chief accidents in which electricity was the direct cause were those in which the employees came into contact with trolley wires. Premature blasts were the chief source of accidents from explosives.

While the progress in reduction of the coal-mine-fatality rate in 1933 can be ascribed to improvement in several classes of accidents, the principal help was the success attending efforts to prevent explosions of gas and dust. An important, if not the chief, factor in this connection was the cumulative benefit of years of demonstrating the effectiveness of rock dust as a preventive of major explosions. Approximately one-third of the yearly production of bituminous coal in the United States now comes from mines at least partly rock-dusted. The latest figures available indicate that 31 per cent of the bituminous-coal output in 1931 was from mines which used rock dust. Of course, it is not believed that all these mines were adequately rock-dusted, but the fact that so large a part of our yearly coal output is now being produced from mines that employ rock dust to prevent or limit the explosion hazard is one of the most encouraging features incident to the promotion of safety in coal mining during recent years; however, mine disasters will occur in future if the available precautionary measures against them are relaxed to any considerable extent.

We should by no means, however, overlook the fact that the reduction of explosions, or even their elimination, will not solve the coal-mine-accident problem. However much we may be heartened by the favorable contrast between the explosion records of recent years and those of an earlier day, it remains true that the biggest problem confronting the industry is the prevention of falls of roof and coal, the most difficult and least spectacular task to which attention should be directed. With no lessening of the endeavor to prevent accidents, whatever their cause, greater effort must be exerted if accidents from falls of roof and coal are to be curbed to the extent desirable.

Electricity and explosives are among the well recognized hazards to which the miner is exposed, and the removal of those hazards, with retention of the greater productivity of labor made possible by electricity and explosives, demands the constant attention of all who are interested in production and safety. Nevertheless, it is perhaps timely to suggest that the major effort to prevent accidents in coal mines should be concentrated on day-to-day falls of roof that kill as many men each year as all other causes combined. The prevention of falls of roof and coal may not offer to the man of technical or professional training the same attractive and alluring field of study as do hazards more readily recognized as involving questions of science or technology; nevertheless, I believe that the fall-of-roof hazard, complicated as it is to a great extent by the human factor, may open an attractive horizon for inquiry to anyone willing to specialize in it.

Because the personal equation looms larger in the falls-of-roof problem than in hazards of certain other types, just as it does in connection with non-fatal injuries caused by hand tools and handling materials, the prevention of roof falls has often been left, apparently from necessity, largely to the miner at the working face. Certainly the individual miner's responsibility cannot be shifted to other shoulders; he must assume a large part of the responsibility for his own safety. Yet the fact remains that falls of roof probably will not be reduced greatly if too large a part of the solution of the problem is left to the 350,000 individuals who work at the face in our coal mines.

The human-engineering questions involved in this subject deserve study by our best mining men. It is a field mentioned by many but explored by few; it offers the newest and probably the greatest opportunity for accomplishment to anyone concerned with the prevention of waste and with financial losses caused by accidents in the mines —with wider benefit to the mining industry than any other field now open for promoting safety in mining.

Bureau of Mines Photo

Burning Tipple Shortly After Explosion in Bituminous Mine.

RESEARCH PROGRESSES

+ Little Hampered by Depression

INCREASED research into problems relating indirectly and directly to coal, its production, treatment and use can be recorded for 1933. In this year's tabulation of such researches, including those under way and those completed or suspended during the year, no less than 169 separate items are recorded, whereas for 1932 only 149 items were listed. The U. S. Bureau of Mines has suspended many of its investigations and completed others, but other organizations are developing new researches.

New uses for coal are receiving some attention, especially from the Anthracite Institute, which is still studying the possibility of using fine coal for filtration of stream water and sewage. In North Dakota, an effort is being made to see if the lignites of that state can be used as oxidizing bodies, as are the lignites of Texas, and whether lignite tar acids can be resinified for the manufacture of varnish.

Fly ash with powdered-coal furnaces consists of a number of light cellular bodies, and the Research Corporation, which is developing the Cottrell system of electrical precipitation, also is studying means of obtaining a light-weight aggregate from such fly ash. As fly ash is an objectionable product when thrown into the atmosphere, any use that will pay for its collection by the Cottrell or other processes will prevent legislation against the use of powdered coal and other fine coals. This development is therefore likely to be of benefit to the coal industry, for even the domestic furnace makes much fly ash. Light brick are in great demand, for the bricks used are a heavy burden on the steel of a skyscraper.

Anthracite was at one time used for the smelting of iron in blast furnaces, and the study, by the Anthracite Institute, of the comparative efficiencies of anthracite and other carbons as reducing agents for oxide ores will determine in part the suitability of anthracite for blast-furnace and kindred operations.

Binder in briquets being either so much added ash or so much added smoke-producing material, efforts have been made repeatedly to briquet without binder, seeing that German lignites can be briquetted satisfactorily solely by heat and pressure. At Urbana, the Illinois Geological Survey has been using impact to assist in compacting the coal and finds a single blow better than two or more. Impact takes less time than compression and gives a much stronger briquet. With compression, coal must lie in the die 15 minutes. Tumbling and shattering tests show that these briquets resist degradation better than natural coal. Wheat straw and other vegetable binders for lignite are being studied in North Dakota.

Hydrogenation and low-temperature carbonization have been receiving very little laboratory attention. Carnegie Institute expects to study the former and Pennsylvania State College the latter, both hoping merely to throw light on the constitution of coal.

Mellon Institute is constructing a portable laboratory for studying air pollution. It is mounted on a light motor truck, with equipment for measuring total solar radiation, visible light, ultra-violet radiation, carbon monoxide, temperature and relative humidity, and will be used in cities that desire such surveys. Studies have been made at Urbana, Ill., to ascertain the best way to reduce the sulphur dioxide in gas, and it has been found that washing the gas with ordinary water is no solution. A plant using only one-hundredth as much water will do the work, if a catalyst is used to aid the conversion of sulphur dioxide to hydric sulphide. With such catalysis sulphuric acid of 40-per cent concentration is obtained, though the time of contact for spray and tower washers is not reduced. With flue gases from coal combustion, impurities render the catalysts less active, so that sulphuric acid of only 4-per cent concentration is obtained.

Studies are being made at Carnegie Institute, one of which is into the halogenation of coal. Coal reacts with bromine and chlorine vigorously, creating heat. It is thought that the reaction between coal and chlorine may produce relatively cheap solvents and dielectrics (electrical resistant materials) of marketable value. Distillations of coal under a vacuum of 0.001 mm. also have been made so as to ascertain what materials are actually distilled from coal. Exterior reactions are likely to occur if distilled material is allowed to mix and react or to fall on a hotter surface than that from which it was distilled. By this vacuum method, the products of distillation are obtained without secondary reactions, and the temperature required for distillation may be lowered 200 deg C. or more thereby.

When coal or coke is burned, gas is diffused to the surface, where a chemical reaction occurs. The over-all rate of combustion will depend on which is the slower of these two actions, so Carnegie Institute is endeavoring to divorce them and has first been working with graphite as a simpler product than either coal or coke and is now preparing to extend the determination to coke; it will use the action of steam on graphite to determine whether the effect of steam on the combustion of coke is helpful and catalytic or the reverse.

By making a cell, somewhat like that in an electric battery, in which the fuel is one of the elements, electrical current could be generated from the fuel, solid or gaseous, with a theoretical efficiency approaching 100 per cent. Today, our generating stations have an efficiency of only 25 to 35 per cent. The chemists of Carnegie Institute have been working with such a cell, but the work was discontinued in November of last year.

Investigations by the institute are being made into the kind and quantity of material extracted from coal by solvents and to discover if the material extracted is actually in the coal ready for solution or is obtained by a very mild form of thermal decomposition. Low-temperature oxidation and the "humic acids" thereby obtained also will be examined by Carnegie Institute. These are a family of complex organic acids of unknown structure which are found in humus, peat and low-rank coals. On severe oxidation these acids yield oxalic, succinic and benzene carboxylic acids, and may, moreover, be used to fix

(that is, absorb) ammonia, and then be used either free or ammoniated as soil conditioners or fertilizers. Added to pottery clays, the humic acids change their character so that they are well fitted to make the clay slip which is used to cover pottery ware and to attach handles and decorative parts.

Coke-oven gas consists mainly of methane, hydrogen and carbon monoxide. Because of the monoxide and the impurities, it has about half as much heating quality as natural gas which is displacing it in some cities. Addition of water gas—which is carbon monoxide and hydrogen—to coke-oven gas in the right proportion before the thermal catalytic treatment should permit a reaction giving a methane-ethane gas much like natural gas, which could be burned with it without adjustment of burners. This would also enable gas made from coal to be used where natural gas is now necessary. Whether the reaction between carbon monoxide and hydrogen to form methane would cause such an over-all loss of energy as to make it uneconomical thus to improve the gas from coal remains to be seen. Carnegie Institute finds that with a nickel catalyst supported on pumice at temperatures from 250 to 300 deg C., methane and small quantities of ethane, propane, butane and pentane are formed.

Do we get all the phenol possible from low-temperature tars? That is another problem to which the institute is applying itself. So air is to be excluded, phenols are to be extracted with alkalis in the presence of nitrogen, extracted phenols are to be converted to stable derivatives, in an effort to increase the phenol production from such tars.

Much of the moisture in coal is not free but is firmly bound in the colloid material. Some of it is not removed upon drying at 105 deg. C. Temperatures up to 250 deg. are frequently necessary to remove all moisture. This is shown by investigations, made at Pennsylvania State College, to establish the equilibrium relations between what may be termed the coal substance and water vapor at very low pressures.

Flotation was studied at this college and at Montana School of Mines. At the first, the bituminous washery sludge was floated in water ranging widely from very acid (pH 2) to quite alkaline (pH 11.4). A distinct difference was observed in the flotation characteristics of pyrite and marcasite when present in the coal. In Montana, the hope is to find a method of selective flotation that will float the coking material and depress the non-coking, thus

Coal Researches in Progress or Completed in 1933 or Planned for 1934

Air Pollution; Smoke Abatement

Carbon Monoxide, Ultra-Violet Radiation and Sulphur Dioxide in Pittsburgh Air.* Mellon Inst.
Corrosion in Flue-Gas Scrubbers.* Harvard Univ.
Design of Cinder and Fly-Ash Removers, completed. Stevens Inst. of Tech.
Dust Loading in Gas Streams, completed. Stevens Inst. of Tech.
Dusts in Air of New York City and Environs.* Stevens Inst. of Tech.
Relative Cleanliness of Fuels in Combustion, completed. Anth. Inst.
Removal of Sulphur Compounds From Waste Gas.* Univ. of Ill.; sponsor, Utilities Research Commission.
Smoke Abatement at Power Plants, Oxidation of Pyritic Sulphur in Bituminous Coal. Utilities Research Com.
Smoking Tendencies of Coals (1933).* Battelle Mem. Inst.
Static Collector for Flue Systems of Stoker-Fired Boilers, completed. Research Corp.

Briquetting of Coals

Briquetting of Coals (1931).* Battelle Mem. Inst.
Briquetting of Coals.* F. D. Snell, Inc.
Briquetting of Coals With and Without Impact (1932).* Ill. State G. S. Div.
Vegetable Binder (Preferably Wheat Straw) for Lignite Briquets. Univ. of N. D.

Chemical Tests of and With Coal

Chemical Structure of Humic Acids (1931).* Carnegie Tech.
Halogenation of Coal (1930).* Carnegie Tech.
High-Vacuum Distillation of Coal (1930).* Carnegie Tech.
Influence of Heating Rate and Maximum Temperature in Properties of Products From Coal (1930).* Carnegie Tech.
Low-Temperature Oxidation (1931).* Carnegie Tech.
Microchemical Analysis of Coal and Coal Products (1931).* Carnegie Tech.
Oxidation With Gaseous Oxygen (1931).* Carnegie Tech.
Principles Involved in High-Vacuum Fractional Distillation (1932).* Carnegie Tech.
Reaction of Coal With Hydrogen (1933).* Carnegie Tech.
Reaction of Nitric Acid With Coal (1931).* Carnegie Tech.
Solvent Extraction (1931).* Carnegie Tech.
Volatile Matter From Inorganic Material of Coal as Bearing on Standard Analysis (1932), completed. B. of M.

Combustion of Coal and Coal Products

Adaptation of Household Stokers to Lignite.* Univ. of N. D.
Automatic Stokers for Domestic Heating.* Univ. of Utah.
Combustibility of Chestnut Anthracite.* Anth. Inst.
Combustion and Radiation, Physical and Chemical Processes Involved. Yale Univ.
Combustion Tests of Virginia Steam Coals.* Va. Poly. Inst.
Crater Method vs. Level Method of Firing.* Anth. Inst.
Design of Domestic Furnace Equipment for Anthracite, completed. Frost Research Lab.
Effect of Higher Wind-Box Pressure on Combustion of Ohio Coal, just started. Ohio State Univ.; sponsor, New York Coal Co.
Effect of Mixing Kinds of Chestnut Anthracite.* Anth. Inst.
Effect of Moisture on Combustion of Coal (1933).* Battelle Mem. Inst. with Ohio State Univ.
Effect of Sizing on Combustion of Anthracite.* Pa. State Coll.; sponsor, Anth. Inst.
Effect of Slate in Coal.* Anth. Inst.
Effect of Soot Formation on Efficiency of Heating Boilers.* Pitts. Exp. Sta., B. of M.
Heat Transfer.* Case School of Applied Sci.
Mechanism of Combustion of Solid Fuels (1930).* Carnegie Tech.
Method of Determination of Minimum Temperature of Sustained Combustion of Anthracite, completed. Pa. State College; sponsor, Anth. Inst.
Testing of Stokers for Residential Heating.* N. & W. Ry. Co.
Tests of Secondary Air-Mixing Devices for Domestic Furnaces.* Pitts. Exp. Sta., B. of M.
Use of Fuels in Brick Kilns.* Pitts. Exp. Sta., B. of M.
Utilization of Iowa Coals in Several Types of Boiler Plants.* Iowa State College with Iowa Coal Inst.
Various Types of Domestic Stokers and Rapid Determination of Heat Balance.* Purdue Univ.

Constitution of Coal

Analysis and Composition of American Coals.* B. of M.
Chemistry of Decay in Relation to Peat and Coal Formation, completed. B. of M.
Composition of Ash of Anthracite* Anth. Inst.
Determination of Chlorides in Coal, completed. Pitts. Exp. Sta., B. of M.
Equilibrium Relations Between Coal Substance and Water Pressure at Very Low Pressures.* Pa. State Coll.
Methods for Determining Arsenic in Coal and Coke. South. Exp. Sta., B. of M.
Mineral Constituents of Coal by Float-and-Sink Methods With Petrographical Examination.* Pa. State Coll.
Separation and Determination of Fusain in Coal.* Ohio State College.
Use of Hydrogenation Methods to Throw Light on Constitution of Coal.* Pa. State Coll.

Economics of Coal and Other Fuels

Relative Carbon Dioxide Produced by Anthracite and Byproduct Coke, completed. Anth. Inst.
Relative Value of Anthracite and Petroleum Coke, completed. Anth. Inst.
Use of Anthracite for Cooking-Equipment and Operation Costs, Appeal, Cleanliness, Convenience and Distribution, completed. Anth. Inst.

Equipment and Material for Mines

Collection and Testing of Field Samples of Permissible Explosives, suspended. Pitts. Exp. Sta., B. of M.
Composition and Properties of Explosives and Explosive Materials.* Pitts. Exp. Sta., B. of M.
Decomposition Products of Carbon-Tetrachloride Fire Extinguishers and Their Analysis.* Pitts. Exp. Sta., B. of M.
Electrostatic Phenomena in Mines, suspended. Pitts. Exp. Sta., B. of M.
Examinations of Worn Wire Rope. B. of S.; sponsor, Eng. Found.
Heat-Treatment of Bits. Continental Industrial Engineers, Inc.
Physical Tests of Explosives and Blasting Devices to Determine Permissibility for Use in Mines.* Pitts. Exp. Sta., B. of M.
Respirators and Masks for Siliceous Dusts. Harvard Univ.
Safety of Electrical Equipment in Mines.* Pitts. Exp. Sta., B. of M.
Safety of Electric Lamps in Mines.* Pitts. Exp. Sta., B. of M.
Safety of Methane Detectors in Mines.* Pitts. Exp. Sta., B. of M.
Safety of Trailing Cables.* Pitts. Exp. Sta., B. of M.

Flotation of Coal

Flotation of Bituminous Washery Sludge in Relation to Hydrogen-Ion Range, completed. Pa. State Coll.
Flotation of Fine Coal, Including Elmore Vacuum Method.* N. W. Exp. Sta., B. of M., with Univ. of Wash.
Selective Flotation to Produce Coking Coals From Weakly Coking or Non-Coking Coals of Montana, may be continued. Mont. S. of M.

Fusibility of Ash

Fusibility as Related to Clinker Formation, completed. Pitts. Exp. Sta., B. of M.
Relation of Chemical Constituents to Fusibility of Coal Ash.* Ohio State Univ.
Softening Temperature and Clinkering of Coal Ash.* Pa. State Coll.; Sponsor, Central Pa. Bit. Coal Producers' Assoc.

Gas—Use, Manufacture, Purification and Treatment

Catalytic Conversion of Carbon Monoxide in Water Gas to Carbon Dioxide With Simultaneous Increase in Hydrogen (1932).* Univ. of Minn. and N. W. Research Found.
Enrichment of Coke-Oven Gas by Catalytic Treatment (1931).* Carnegie Inst. of Tech.
Gaseous Products From Carbonization of Coal, Analysis, Cracking Effects of High Temperature on Gas From Primary Coking.* Columbia Univ.
Gas-Making Qualities of Illinois Coals.* Ill. State G. S. Div.
High-B.t.u. Water Gas From Lignite Char and Sub-Bituminous Coke (1932).* Univ. of Minn.
Influence of Sodium Carbonate in Increasing Activity of Coal in Producer-Gas Generator Operation. Univ. of Mich.
Powdered Coal in Water-Gas Manufacture. Univ. of Mich.
Ratio of Carbon Monoxide to Hydrogen in Incomplete Combustion.* Columbia Univ.
Removal of Hydrogen Sulphide, Gummy Deposits and Nitric Acid From Coal Gas. Mellon Inst.; sponsor, Koppers Research Corp.
Synthesis of Hydrocarbons From Coal Gas and Water Gas.* Pitts. Exp. Sta., B. of M.
Water Gas and Heavy Oil in Manufacture of Carbureted Water Gas. Univ. of Mich.

*Items starred indicate that work on such projects was still continuing at end of 1933. Figures shown in parentheses indicate year in which particular research project was started.

obtaining a good coking fraction from a coal that is either non-coking coal or coal of feeble coke properties. This study will be supplemented by microscopy.

Twelve of the mineral constituents of coal have been identified by the investigators at Pennsylvania State College. After separation by float-and-sink methods, petrographic examination was made of the concentrated minerals. Most of the examinations of coals of the United States were made before the technique of coal analysis was as well developed as it is today. Illinois proposes to bring its analytical surveys up to date, and, at the urging of the American Gas Association, the U. S. Bureau of Mines has been making modern surveys of the coking and gas-making coals. In Illinois, the constituents that make up the coals, their proportions in different localities in the State, how they affect the various uses of the coals and what new uses can be found for Illinois coals, either in new forms of fuel or for non-fuel use, will all be determined and evaluated. For these studies, samples of the coal beds are being obtained in the form of columns extending from roof to floor, for examination by microscope, X-ray appliances, microphotometer and chemical apparatus. Coking qualities of Illinois coal have hitherto been tested in equipment suited to Eastern coals. An attempt will be made to design equipment suited to Illinois coals and to determine what results can be obtained from the various coals of that State.

Experiments made into grindability by the Babcock & Wilcox Co. show that the grindability index of Scranton (Pa.) coal is 26 and of Indiana (Pa.) coal, 63 to 117. The latter figure for Indiana is the highest of any obtained for coal, showing it to be the most grindable of any. Friability has relation not to grinding to a fine size but to degradation of coal of larger size by impact and attrition. Friable coals are not necessarily easy coals to grind. Tests at the Northwest Experiment Station of the U. S. Bureau of Mines show that coal susceptible to impact is not necessarily susceptible to attrition; therefore it would seem best to use a tumbler test which embodies both.

An agglutinating test for coal was prepared and presented to the American Society for Testing Materials recommending test with several ratios of sand to coal and specifying definite methods for conducting the test. The sand does not fuse. Some coal, such as Pocahon-

(Turn to page 57)

Coal Researches in Progress or Completed in 1933 or Planned for 1934—*Continued*

Health of Mine Workers

Carbon-Monoxide Pathology and Poisoning, suspended. Pitts. Exp. Sta., B. of M.
Physiological and Pathological Action of Gas and Vapors, suspended. Pitts. Exp. Sta., B. of M.
Physiological Effects of Mine Dusts, suspended. Pitts. Exp. Sta., B. of M.
Plastic State of Coal During Coking, suspended. Pitts. Exp. Sta., B. of M.

High Temperature Carbonization (See Surveys, Also Physical Tests)

Coke as a Domestic Fuel.* Pitts. Exp. Sta., B. of M.
Coking Characteristics of Illinois Coals.* Ill. State G. S. Div.
Coking Indexes of Coal.* Univ. of Iowa with B. of M.
Preparation and Treatment of Domestic Coke; Combustion Characteristics of Coke. Mellon Inst.
True Density of Coal and Coke.* Mellon Inst.

New Uses for Coal and Its Byproducts

Comparative Efficiencies of Anthracite and Other Carbons as Reducing Agents for Oxide Ores.* Anth. Inst.
Method of Producing Light-Weight Aggregate From Fly Ash of Powdered Coal, completed. Research Corp.
Reactivity of Anthracite With Carbon Dioxide, completed. Anth. Inst.
Reactivity of Anthracite With Steam.* Anth. Inst.
Resinification of Lignite Tar Acids With Reference to Varnish, to be started. Univ. of N. D.
Suitability of North Dakota Lignite for Activated Carbon Purposes.* Univ. of N. D.
Use of Anthrafilt for Filtration of Stream Waters and Sewage.* Anth. Inst.

Physical Tests of Coal, Including Agglutination (See Pulverized Coal)

Agglutination Tests of Virginia Low-Volatile Coals, to be continued. Va. Polytechnic Inst.
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Slacking Indexes of Iowa Coals.* Univ. of Iowa with B. of M.
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Preparation of Coal (See also Flotation)

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New Jig of Baum Type (1930)* Battelle Mem. Inst.; sponsors, group of iron and steel producers and Jeffrey Mfg. Co.
New Type of Air Table (1932).* Battelle Mem. Inst.; sponsor, Jeffrey Mfg. Co.
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Quantity of Mine Drainage; Effect of Dilution on Water Drained; Neutralization; Origin of Acid; Effect of Mine Drainage on Sewage, Abandoned Mines; Sulphur Solubility of Coal in Sterilized and Unsterilized Solutions.* Univ. of W. Va.
Waste Waters From Mines.* Pitts. Exp. Sta., B. of M.
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Identification and Quantitative Isolation of Components of Phenolic Fraction of Coal Tars or Extracts (1932).* Carnegie Tech.
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BITUMINOUS RESEARCH

+ Needs Three-Point Program

To Check Losses and Widen Markets

By CLYDE E. WILLIAMS

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PRODUCTION of bituminous coal in the United States reached a peak in 1918. Consumption remained fairly constant until 1929 (except for the low points in 1921 and 1922), but has been declining at a rapid rate ever since. Moreover, consumption of bituminous coal in relation to other sources of energy has been decreasing since 1915.[1] This reduction in consumption has been caused by: increase in the efficiency in the use of coal, especially by large industrial consumers, such as the railroads, power plants, and the steel industry; improvement in the quality of coal through the selection of higher grades of coal and the preparation of cleaner coal; substitution of oil, gas, and hydro-electric power; and, during recent years, by the depression.

This enormous decrease in the consumption of coal and the consequent financial losses, especially during the last four years, have brought leaders of the industry to the realization that something must be done to alleviate the situation. The necessity of improving internal conditions in the industry was recognized several years ago and the excellent remedial step of the formation of coal-selling agencies, such as Appalachian Coals, Inc., was taken. The more recent formulation of the bituminous coal code may aid in accomplishing the desired improvement. Hand in hand with these new agencies a practical research program will go far in reestablishing the industry on a sound basis. Such a program should regain lost markets, increase present uses, and find new ones. Without a successful research program the industry will not receive the expected benefit from the painful task it is going through in the establishment of better prices and better conditions within the industry. As the price advantage of coal is reduced, its utility must be improved.

The coal industry has made progress in the development of improved methods of production and preparation of its

Clyde E. Williams

product. Individual companies have made important developments in the coking and byproduct fields. Large industrial users of coal, particularly the power plants, have contributed much in the way of improving the efficiencies of coal burned to generate heat. By so doing they have caused a temporary decrease in the consumption of coal but have actually served the coal industry by improving the competitive position of coal in relation to gas and oil. Choice of fuel for this use now is largely based on price. Similarly, the railroads have effected large savings in coal by learning to use it more efficiently. Still further savings, however, are indicated as necessary if replacement by competing methods of traction, as the diesel engine, is to be prevented.

Much valuable research work on bituminous coal has been done and is still going on, but too large a proportion of this work has been devoted to developments looking far into the future. For example, the gasification of coal at the mine or at strategic centers for distribution of gas to the consumer long has been the dream of idealists. Although a long way off, the realization of this dream is being hastened by the increased use of gas and the building of extensive systems for its transmission and distribution.

The production of high-temperature coke for domestic purposes and coke-oven gas for general distribution has proved economical in several instances, and the domestic use of coke is increasing. This development doubtless will increase, owing to the desirability of coke as a domestic fuel. Low-temperature carbonization processes to give virtually the same products—that is, smokeless solid fuel, gas and byproducts—have been the subject of much research, but commercial attempts have not been successful.

Research on these problems and fundamental research on the constitution of coal are of value and should be continued, but increased effort should be directed to the immediate practical problem of increasing the competitive value of coal to prevent substitution, particularly in the domestic and small industrial field.

Remarkable advancement has been made in the application of oil and gas

[1] Harper, R. B.: "Competition Between Natural Gas and Coal." International Conference on Bituminous Coal, Vol. 1, 1931, pp. 194-239.

to domestic and small industrial furnaces. The drive for such business now being made by the gas and oil companies and the stop-smoke campaigns have brought the public to appreciate the value of convenience and cleanliness in the use of fuels. The cost factor is assuming secondary importance in a large portion of the domestic market. The startling increase in the sale of domestic stokers in 1933 is evidence of the public's acceptance of this situation.

Investigation[2] has shown that, in general, it costs less to own and operate the mechanical domestic coal stoker, as now developed, than to use oil or gas. The initial cost is a detriment to its use, but this could be overcome by the institution of a method of financing by which a monthly charge would be made for its use. The successful wide distribution of the telephone doubtless is largely due to the method of financing its use. Fewer people would have telephones if they had to pay the $350 investment necessary to make it available.

The present domestic stoker represents much progress toward fully automatic heating with coal. But with most bituminous stokers, coal must still be shoveled into the hopper and ashes must be removed; fires must be relighted once they have gone out. All coals are not equally suitable and information is lacking as to the requirements of coal for such use. The development of fully automatic small furnaces of low first cost to give convenience, cleanliness and fuel efficiencies equivalent to those possible with gas and oil should become the immediate principal phase of a practical research program. The problem is not simple. The diverse nature of various bituminous coals and the many factors involved in their efficient use require a comprehensive research program. However, by overcoming the advantages of gas or oil, coal would be made the preferred fuel, because of its lower cost.

The use of pulverized coal in domestic furnaces has interesting possibilities and the success of some of the installations made recently hold promise for this type of heating. Problems in automatic charging, ignition and combustion should be solved readily. Development of a simple method for the collection of fly ash will not be so easy, but is essential. The quality of coals required for this use must be determined, as in the case of the domestic stoker.

Even after the perfection of automatic, clean, domestic coal-burning equipment, many homes must continue to use existing equipment. The desire for a clean city atmosphere and the increasing appreciation of the high cost of smoke and dirt require that coal be improved to give less dirt in handling and that it be burned to produce a minimum of dirt and smoke. Too many of us spend too much time and effort trying to keep warm and clean at the same time. Better preparation of coal and education in proper methods of firing are required.

The variation of properties of different layers of coal in the same seam offers the possibility of selective mining to produce grades of coal better suited for various uses—that is, ash-fusion point, coking quality and other characteristics of the coal might be varied by selecting for given uses only certain horizontal sections of the bed.

A low-cost briquetting process would make possible conversion into a salable product the fine coal that results from degradation in storage and handling. It also would be used to treat slack coal in times of excess production and thus balance the production and consumption of different sizes.

New uses for bituminous coal having promise for a major tonnage outlet may exist. Few raw materials for any use are produced so uniform in properties and so cheaply as coal. As yet, no new large uses have materialized, though many have been proposed. Some study has been given to the use of coal as a fertilizer and as a substitute for sand as a filtering medium. One enthusiast has gone so far as to build a house of coal. Others herald a bright future for coal as a raw material for the chemical industry. Much coal now goes into chemicals by way of by-products from the coke oven. The production of these is limited by the consumption of coke and gas, and the income from their sale is largely credited to the coking operation. Research work designed to produce other chemicals—for example, plastics—from bituminous coal is going ahead and should be largely augmented. But the total tonnage of these chemicals is small when compared to the half billion tons annual capacity of the coal mines, so that the industry cannot look to these new uses to provide an important outlet in the near future.

It would seem desirable that the present research work on bituminous coal be augmented by the following: First, a program leading to the improvement in the combustion of coal in solid form for immediate benefit to the coal producer; second, development of methods for the conversion of coal to gas and coke or gas entirely, or to a liquid fuel; and, third, the development of new uses for coal. The early successful completion of the first phase of this program will tend to regain lost markets and retain present ones. Prosecution of the second and third phases will insure progress and avoid the possibility of further losses of markets to competitors who already are embarked upon a large program of research and exploitation.

[2]Sherman, R. A.: "Relative Efficiencies of Domestic Fuels in Relation to Their Costs and Their Advantages." A.I.M.E. Contribution 63, 1933, 8 pp.

RESEARCH PROGRESS

Little Hampered by Depression

(Concluded from page 55)

tas, agglutinates well with an 8 : 1 mixture and loses agglutinating qualities rapidly with larger quantities of sand; but some, like Connellsville, do best with a 12 or 14:1 sand ratio.

Tests of domestic furnace equipment of many kinds have been made by the Anthracite Institute. Purdue University, in making domestic stoker tests, mounts boiler, stoker, condenser and pump on scales so that at 10-minute intervals differences in weight can be determined and a heat balance obtained if desired. Frost Research Laboratory has been working on a new method of burning fine anthracite, applicable, it is said, to any firebox boiler having at least 4 sq.ft. of grate area. Coal is passed from the bin to the boiler by a hand device, and no equipment other than a motor-driven blower connected to the ashpit and a few special fire tools are needed. About 400 lb. of coal is fired at one time so that the fuel need not be replenished ordinarily more than once in two days.

Ashes in average cold weather are removed about once a week, when clinker, said to be almost dust-free, is lifted off the grates and drawn through the firedoor. The blower, being of higher pressure than usual, is said to be capable of driving air through the mass of coal or clinker. Before charging, waste paper and other burnable household refuse is deposited in the boiler, pushed to the back and not covered. The coal is then added, the carbon monoxide being ignited by the burning refuse. Suitability for clinkering coal and absence of fly ash are claimed as advantages.

Pressure of business, due to NRA codification, wage and cost revisions, and labor unrest, has prevented the research committee of the National Coal Association from launching its projected research work.

ANTHRACITE RESEARCH

+ Seeks New Markets

For Both Fuel and Non-Fuel Uses

By H. G. TURNER
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READERS of *Coal Age* undoubtedly are familiar with the engineering research that has been conducted for many years by individual anthracite companies and independent engineers in coal mining, handling, transportation and preparation. Many companies have gone further than this and have made studies, in their own and in consulting laboratories, of other problems related to their particular conditions and needs. In recent years, some of the larger companies have organized separate research departments.

There was a growing feeling, however, that much costly duplication of effort could be avoided by establishing a central organization, in no way handicapped by trouble shooting (as is often the case with an individual laboratory), to attack the many problems which touch the welfare of the whole industry. This feeling crystallized a few years ago into the organization of a research division of the Anthracite Institute. It is to the progress of this division that this article will be devoted.

The Anthracite Institute is conducting both engineering and scientific research. If statistical studies are to be classed as research, the institute can be said to be conducting three kinds of research. Studies of the adaptability of anthracite to specific industries, such as ceramics, is a fourth activity which may be classed as research.

Engineering research is carried on in the institute's laboratory at Primos, Pa., under the direction of Allen J. Johnson. Considerable time is devoted to the testing and approval of equipment developed by others for use with anthracite. In addition, this laboratory is developing equipment of its own to fill in the gaps left by manufacturers of stokers, furnaces, stoves, thermostats, ash-removal devices, and other appliances. Combustibility studies of various types of anthracite also are being made in comparison with other fuels, taking into account composition, toughness, specific gravity, ash fusion, ignition temperatures, cleanliness, etc.

The adaptability of anthracite for ceramic use has been studied very thoroughly, with laboratory tests supplemented by field surveys and tests. The behavior of anthracite in gas producers and the adaptability of the resulting gas to various industries have been

H. G. Turner

investigated in considerable detail. The suitability of anthracite for home and industrial cooking, together with the development and study of cooking equipment, has been another problem to which much thought has been given.

Scientific research is conducted in the Anthracite Institute department of scientific research at Pennsylvania State College under the direction of the writer. This laboratory is studying the composition, constitution and properties of anthracite from all beds in all parts of the region. Thanks to the U. S. Bureau of Mines, which cooperated in the field work, there are on hand for study over 200 samples on which have been run proximate analyses, ultimate analyses, sulphur determinations, B.t.u. determinations, and ash-softening temperatures.

Study of these analyses has given much valuable information. For one thing, it has made it possible to draw an isovol map of the entire anthracite region so that one can tell by the location of a mine just what the volatile matter should be for the coal in question. Summaries and averages of these analyses enable one to anticipate the complete composition, within very narrow limits, of any anthracite from any part of the region. Specific gravity determinations were made for all samples. These showed that for the whole area there is a close relationship between specific gravity and volatile matter.

The reactivities of these samples with carbon dioxide and with steam at various temperatures have been determined. The composition of the volatile matter also was analyzed. Reactivity of anthracite with carbon dioxide was found to be much higher than is indicated by the few determinations recorded in the literature. The volatile matter was found to be over 85 per cent hydrogen; the remainder was largely methane, carbon monoxide and carbon dioxide. These studies have thrown considerable light on the reactions which take place in the producer.

Through two fellowships sponsored by the institute, relative ignition temperatures and ash compositions are being determined on these same samples. In addition to the ordinary type of chemical analyses, the ash is being subjected to spectrographic analyses for the identification of rare elements that might otherwise escape detection. As time permits, these samples will be studied from the standpoint of specific heat, heat conductivity, electrical con-

ductivity, radiation characteristics, absorptive properties, and probably several other things. Some of these properties already have been studied in a preliminary way, but a more exhaustive investigation is contemplated.

The anthracite industry would benefit greatly if profitable markets could be found for a higher percentage of the material now mined but not sold. Studies conducted two years ago showed that the shales will make good lightweight aggregate, face bricks, and other ceramic products; studies during the past two years demonstrated that certain anthracite fines make an ideal filter medium for water filters, sewage filters, and the clarification of waters and liquids containing chemicals which attack silica.

One of our research objectives is to explore thoroughly the composition and properties of the raw materials which come from the anthracite mines. The other objective is to find new uses and new applications for anthracite and its associated materials as well as a better knowledge of how anthracite releases its energy. It cannot be emphasized too strongly that new non-fuel uses, new applications and new methods of burning can result in a big way only through a thorough study of the raw materials. This is illustrated by frequent requests for such information as the coefficient of linear expansion of anthracite, the percentage of titanium in the ash, the forms of sulphur, the temperatures at which the volatile matter is driven off, composition of the volatile matter, coefficient of friction, quantity and quality of light reflected by anthracite, etc. These questions do not come from those who are merely curious but from people who have a definite problem in mind.

A handbook of facts of every conceivable detail of composition and behavior will be of inestimable value in reaching the second objective. Its value will not be confined to the anthracite industry alone but to countless other industries that are always on the lookout for new raw materials for their processes.

We may end up with entirely new methods of burning anthracite in present appliances or with entirely different appliances. We know that we shall end up with new non-fuel markets, for we have already entered one in the filter field, where a long series of tests has shown that fine anthracite is superior to sand, now in common use, in the removal of turbid matter and bacteria. Moreover, due to its low specific gravity and angular shape, anthracite will give longer filter runs and permit more thorough filter cleaning with low wash-water rates. A series of solubility determinations with alkali has shown that anthracite is a splendid filter aggregate to use in hot-water softening processes.

Experiments now being made seem to indicate that anthracite filters will largely overcome the lime incrustation difficulty experienced where water is softened by the lime-soda process. Incrustations formed on sand adhere so tenaciously that they cannot be removed by the ordinary filter wash; incrustations which form on anthracite are loosely bound, so that much of the lime is removed by ordinary filter washing. We may find that an anthracite filter medium can be prepared which will be of such size and shape that no coating at all will form. Inasmuch as the demand for municipal water softening is growing, this behavior of anthracite with lime should create quite a demand for anthracite in those regions where these difficulties are experienced.

Two municipalities have replaced their sand with anthracite at their sewage plants and are highly pleased with the results. One of these cases is a filter for the final sewage effluent, and the other is a replacement of sand in the ordinary sludge beds. A third type of sewage filter is a screen covered with a few inches of anthracite, where solids are removed continuously and the resulting cake of solids and anthracite is burned under the boilers in the power plant. The municipal engineer making the latter tests seems to feel that there are good possibilities for this method of treatment.

According to Dr. C. L. Mantell, one hundred million dollars' worth of carbon for purposes other than fuel is produced annually in the United States. Anthracite, being essentially a carbon, should be adaptable to at least a part of this large market, and considerable time has been devoted to studying these market possibilities. Results so far look very promising, especially in the field of metallurgy. There is no doubt in our minds that anthracite would find a wide field of usefulness as a raw carbon in many industries if more engineers and scientists were acquainted with its composition and properties. For this reason, we feel that a valuable part of our work consists in publishing our findings and making contacts with industries that could use anthracite advantageously in their processes.

In these years of rapid change, no major industry can exist without research. Coal is beginning to realize this truth and to take steps to modernize its set-up through individual and collective research. If research is pushed vigorously, there is no reason why millions of dollars should not come into the anthracite industry annually as a result of the development of new uses and new applications alone. In addition, what is learned about more efficient methods of mining, preparing, transporting, merchandising and burning anthracite should pay big dividends. The educational and advertising value of anthracite research probably will go a long way toward paying the cost.

Achievements in research come as a result of well-planned, well-executed, hard work. Commercially valuable results from scientific research, even under the best conditions, generally should not be expected under four to eight years. Engineering and statistical research, and application studies, on the other hand, may yield commercial results in a shorter period. These time estimates are not a matter of personal opinion but are the results of actual experience by the foremost research organizations of the country.

A proportion of the investigations carried out will show negative results. If this proportion of misses comes before the hits, the outlook may be very discouraging for a while both to the research workers and to the supporters of research. The success of all coal research will rest in a large measure on how the industry reacts to these inherent factors of time and negative results. The consoling thought is that research in many industries during the past decade has yielded enormous profits, and that there is no valid reason for believing that the coal industry should be an exception to the rule.

Research has come into the industry to stay. It must grow to keep pace with the social and economic progress of the world. A century ago people walked, or rode on some animal. They did the same thing seven thousand years ago. Today we ride in palatial express trains, automobiles, airplanes—all developments of the past hundred years. This bit of history is not peculiar to transportation. A world virtually stagnant for seven thousand years suddenly began to improve itself as a result of a little research here and there. These improvements not only paid big dividends but pointed the way to further profitable improvements until today industrial competition is largely a competition in research developments. Any major industry without a powerful research organization is not only working under a terrific handicap but is traveling on the road to extinction.

Power Economies

Must power be generated at the mine mouth? Because of water-supply conditions, a Southern operator has built a power plant 6.6 miles from his mine and expects to recover his investment in four to five years.

An Eastern mine faced with rising power costs due to increasing mechanization worked out a system of control which smoothed off the peaks and effected substantial savings.

Both these stories will be told in the March issue of *Coal Age*.

PREPARATION

+ At Bituminous Coal Operations

Reflects Changing Market Demands

BITUMINOUS preparation developments in 1933 were marked by an extension of the trend toward revision of existing plants to increase flexibility and add to the range of sizes shipped, and increased attention to the technical efficiency of cleaning processes and the beneficiation of the smaller sizes. Despite executive preoccupation with NRA codes during the greater part of the year, the record of new installations compared favorably with that for 1932.*

Plant revisions in the case of operations preparing coal primarily by screening and hand-picking took the form of installation of screening and loading equipment for producing an additional size or sizes—usually in the lower size range—and the installation of auxiliary mechanical units for improving the quality of certain sizes. These developments directly reflected the continuing trend toward smaller sizes growing out of the rise of the domestic stoker and the demands of industrial consumers for more efficient and economical fuel. The latter conditions were responsible also for a continuation of the movement toward the installation of crushing and screening facilities for breaking down and preparing larger sizes, either continuously or during seasons of low demand for coarse coal.

Dedusting made still another avenue leading to the revision of existing plants, either through the installation of vibrating screens, high-speed shaker screens or some type of aspirating equipment. While dedusting equipment, particularly of the aspirating type, was the object of considerable interest in 1933 as a means of remedying some of the operating and sludge-disposal difficulties in wet washing, actual installations, according to available reports, were confined to the preparation of stoker coal —domestic in particular—with Illinois apparently leading both in experimental work and actual installations.

The Chicago, Wilmington & Franklin Coal Co., which installed a pilot plant at its New Orient mine nearly three years ago for the production of "air-washed" ⅜-in.x10-mesh and ⅛-in.x48-mesh stoker coal, added new and larger facilities last year. The Bell & Zoller Coal & Mining Co. also entered the lists in 1933 with a plant at Zeigler No. 1 mine, Zeigler, Ill., for the production of "dedusted buckwheat" (⅛-in. x10-mesh). Equipment there consists of a Tyler vibrating screen handling raw ⅛x0-in. carbon at the rate of 50 tons per hour. Results indicate that less than 3 per cent of the minus 10-mesh material is left in the buckwheat after dedusting. No additional operating labor is required.

Laboratory experimental tests over a wide range of coals were carried on by a number of manufacturers of dedusting equipment. In addition, the Allen & Garcia Co. made tests with an aspirating type of equipment at a number of mines in Illinois and Indiana; in many cases, it was reported, dedusting improved the analysis of the coal. The same organization also developed the "Mekanopic" for performing the picking job usually done by hand pickers. The equipment is designed, according to the company, for installation in existing structures in the space ordinarily occupied by the usual type of picking equipment, and a full-sized experimental unit went into service at the No. 18 mine of the Peabody Coal Co., West Frankfort, Ill., last year.

The Peabody unit was installed in the rescreening plant in the place of the picking table formerly used for 2x1¼-in. nut, one of the four sizes produced by the rescreener. This unit consists of a box-like container 6 ft. wide and 28 ft. long, divided into sections, or cells, three in length and two in width, or six in all. The cells are equipped with baffles and skimmer plates, which are adjustable to accommodate fluctuations in the type and quantity of feed. Deflectors are mounted on the skimmer plates to direct the clean coal off to chutes extending the length of the table along the sides. Screens are installed in the chutes to remove any fine coal which may pass over with the clean coal. Screens and chutes also are installed at the end of the unit to separate the fine coal used as a cleaning medium from the refuse and to direct the two products to their respective destinations.

Cleaning is accomplished by maintaining on the table, by means of the reciprocating motion, assisted by the baffles, a bed of ⅛x0-in. carbon in a sufficiently fluid condition to support the clean, or lighter-gravity, coal and yet

*Preparation developments in the anthracite division of the industry are discussed in the article beginning on p. 44 of this issue; the annual tabulation of new installations at both anthracite and bituminous operations, including details on types of equipment and capacities of specific installations referred to in the body of this article, appears on p. 61.

allow the refuse, or heavy-gravity material, to sink. The tendency of the clean coal to rise is furthered by a certain size classification that takes place, the coarse coal coming to the top and thus, it is explained, maintaining the fine bottom bed. The skimmer plates are set to cut above the refuse and below the coal. These settings are adjusted so that a relatively larger proportion of the clean coal will pass under the first with the refuse. This concentrated feed is delivered to the second skimmer with a closer adjustment, which is called on to handle only one-half to one-third the quantity of material. The same applies to the third cell and to any subsequent cells which might be installed.

The proportion of carbon circulated is about one ton per ton of table feed, and an 8-mesh screen is used to remove fines and dust, which is delivered to a degradation conveyor and returned to the fine-coal bin. Test results show, it is reported, that with a raw feed containing 10 per cent sinks at 1.50 specific gravity a clean coal containing 1 per cent sinks at 1.50 gravity can be obtained with a refuse containing 70 per cent sinks and 30 per cent floats. Uniform results are also cited, in addition to a power consumption of 1 hp. per ton of coal treated per hour, which it is expected can be reduced 50 per cent. The process at present is confined to a presized feed having a size ratio not in excess of 3 to 1, which will accommodate the egg and nut sizes made at most mines. No attempt has been made to treat coal under $\frac{3}{8}$ in.

Following an extended period of experimental work at the Battelle Memorial Institute, the Jeffrey Mfg. Co. entered the market with a new air table late in the year as a part of its program of expansion in the preparation filed.

While dedusting installations centered in Illinois last year, additional employment of mechanical cleaning units for the treatment of part of the plant input —usually slack—was wide flung. Washing units for handling $1\frac{1}{4}$x0-in. slack, for example, were put in by the Commercial Fuel Co. in Kansas and the Windsor Coal Co. in Missouri. Additional cleaning capacity was added to the equipment of the Pittsburg & Midway Coal Mining Co., enabling that Kansas stripping operation to separate all coal from 6-in. down into two major sizes for washing and/or rewashing. New Mexico was represented in this development by a Phelps Dodge installation for nut; and the Montana Coal & Iron Co. put in an air unit to treat 2x$\frac{3}{4}$-in. material.

In Kentucky, the Inland Steel Co. added a pneumatic separator with dust-collecting equipment and storage bin to plant facilities which originally had been designed with an eye to such additions. The Edgefield Coal Co., in Ohio, and the Hardy Coal Co., in West Virginia, also installed air tables for treating small

COAL'S 1933 CONSTRUCTION RECORD

THE 1933 RECORD of installation of new coal preparation facilities is given by companies in the table below. This record covers both the bituminous and anthracite industries.

This summary of new construction in 1933 was made possible through the cooperation of the following manufacturers of equipment (abbreviations used in the table follow the names in parentheses): Allen & Garcia Co.; American Coal Cleaning Corporation (American); Heyl & Patterson, Inc. (Heyl & Patterson); Hydrotator Co.; Jeffrey Mfg. Co. (Jeffrey); Koppers-Rheolaveur Co. (Rheolaveur); Link-Belt Co. (Link-Belt); McNally-Pittsburg Mfg. Corporation (McNally-Pittsburg); Roberts & Schaefer Co. (Roberts & Schaefer); Robins Conveying Belt Co. (Robins); United Iron Works Co. (United); Morrow Mfg. Co. (Morrow); Fairmont Mining Machinery Co. (Fairmont); Kanawha Mfg. Co. (Kanawha); Deister Concentrator Co. (Deister-Overstrom); H. M. Chance & Co. and the Chance Coal Cleaner (Chance); Wilmot Engineering Co.; Dorr Co.; and the Deister Machine Co.

New Topworks Construction in 1933*

Coal Company	Plant Location	Capacity, Net Tons per Hour	Preparation Equipment
Acme Coal Cleaning Co.	Avella, Pa.	600	Heyl & Patterson[1]
Allegheny River Mining Co.	Kittanning, Pa.	250[2]	Roberts & Schaefer
		100	Hydrotator Co.[3]
Anchor Coal Co.	Highcoal, W. Va.	200	McNally-Pittsburg
Avis-Eagle Coal Co.	Neibert, W. Va.	200	Kanawha
Big Bend Coal Co.	Twin Rocks, Pa.	150	Roberts & Schaefer
Block Coal & Coke Co.	Turley, Tenn.	125	Morrow
Buck Mountain Coal Mining Co.	Fern Glen, Pa.	200	Chance
C. P. Calloway Coal Co.	Cepece, W. Va.	50	Roberts & Schaefer[4]
Consolidated Coal Co.	Saginaw, Mich.	150	Robins[5]
	New Lothrop, Mich.	150	Link-Belt
Commercial Fuel Co.	Cherokee, Kan.	125	McNally-Pittsburg[6]
Courtney Coal Co.	Gypsy, W. Va.	200	Fairmont
East Bear Ridge Colliery Co.	Mahanoy Plane, Pa. (2)	65	Hydrotator Co.[7]
Edgefield Coal Co.	Canton, Ohio.	30	American[8]
Electric Shovel Coal Corporation	Oakland City, Ind.	150	Robins
Elmira Coal Co.	Elmira, Mo.	250	United
Fidelity Fuel Co., Inc.	Shaft, Pa.	150	Chance
Fowler Coal Mining Co.	Richmond, Mo.	50	United
Green Ridge Coal Co.	Scranton, Pa.	15	Deister-Overstrom[9]
Haddock Mining Co.	Silver Brook, Pa.	12	Deister-Overstrom[9]
Hardy Coal Co.	Isaban, W. Va.	50	American[8]
Hatfield-Campbell Creek Coal Co.	Cincinnati, Ohio.	125	Morrow
Hazle Brook Coal Co.	Jeddo, Pa. (2)	90	Hydrotator Co.[7]
	Raven Run, Pa. (2)	32	Deister-Overstrom[9]
Hillman Coal & Coke Co.	Fayette City, Pa.	250	Jeffrey
	Brownsville, Pa.	250	Jeffrey
Hume-Sinclair Coal Co.	Hume, Mo.	100[10]	McNally-Pittsburg
Indian Head Anthracite, Inc.	Tremont, Pa.	200	Rheolaveur
Inland Steel Co.	Wheelwright, Ky.	320	American[11]
Interstate Coal Co.	Bonanza, Ark.	300	United
Jeddo-Highland Coal Co.	Jeddo, Pa. (2)	30	Deister-Overstrom[9]
Jewell Ridge Coal Corporation	Jewell Ridge, Va.	400	Morrow
Johnstown Coal & Coke Co.	Portage, Pa.	75	Robins[5]
		150	Link-Belt
Lake Superior Coal Co.	Superior, W. Va.	100	Kanawha[12]
Leckie Smokeless Coal Co.	Anjean, W. Va.	300	Robins[5]
Linton-Summit Coal Co.	Terre Haute, Ind.	250	McNally-Pittsburg[13]
Maryd Coal Corporation	Simpson, Pa.	100	Chance
Maumee Collieries Co.	Keller, Ind.	625	.....
Midland Electric Coal Corporation	Middle Grove, Ill.	600	Link-Belt[13]
			Allen & Garcia
Mohawk Mining Co.	Kittanning, Pa.	100	Robins[5]
Montana Coal & Iron Co.	Bear Creek, Mont.	40	Roberts & Schaefer[14]
New Upper Lehigh Coal Co.	Upper Lehigh, Pa.	150	Chance
Panther Coal Co.	Hurley, W. Va.	300	Jeffrey
Pardee & Curtin Lumber Co.	Webster Springs, W. Va.	75	Link-Belt
Pearl Coal Co.	Richmandale, Pa. (2)	40	Wilmot[4]
Phelps Dodge Corporation	Dawson, N. M.	90	Roberts & Schaefer[4]
Philadelphia & Reading Coal & Iron Co.	St. Nicholas, Pa. (2)	130	Hydrotator Co.[15]
	Shamokin, Pa.	30	Hydrotator Co.[7]
Pine Hill Coal Co.	Minersville, Pa.	50	Chance
Pittsburg & Midway Coal Mining Co.	Pittsburg, Kan. (2)	225	McNally-Pittsburg[6]
Pittsburgh Coal Co.	Negley, Ohio.	350	Rheolaveur
Porter Coal Co.	Porter, Ala.	...	Deister-Overstrom[9]
Powhatan Mining Co.	Powhatan Point, Ohio.	110	Robins[5]
Price Hill Colliery Co.	Price Hill, W. Va.	75	Robins[5]
Raine Coal & Lumber Co.	Duo, W. Va.	250	Kanawha
Shuler Coal Co.	Waukee, Iowa.	125	Link-Belt
Standard Coal Co.	Wheatland, Ind.	100	Link-Belt[12]
Stevens Coal Co.	Shamokin, Pa. (2)	50	Wilmot[4]
Stonewall Jackson Coal Co.	Wellston, Ohio.	400	Morrow
Susquehanna Collieries Co.	Mt. Carmel, Pa.	40	Hydrotator Co.[7]
Truax-Traer Lignite Co.	Kincaid, N. D.	250	McNally-Pittsburg
Vibbard Mining Co.	Vibbard, Mo.	60	United
Universal Coal Washing Co.	Pinckneyville, Ill.	100	McNally-Pittsburg[6]
Wellston No. 2 Coal Co.	Wellston, Ohio.	125	Morrow
Weston Coal Co.	Shenandoah, Pa.	300	.....
Windsor Coal Co.	Windsor, Mo.	60	McNally-Pittsburg[6]
Wyatt Coal Co.	Laing, W. Va.	250	Kanawha

*Also includes rebuilt plants and major installations of preparation equipment in existing structures; installation of more than one cleaning unit is indicated after the plant address.

[1]Central cleaning plant equipped with Chance cones. [2]Total plant capacity. [3]Air-sand plant; capacity of 100 tons per hour included in total plant capacity. [4]Mensies hydroseparators. [5]Includes vibrating screens. [6]Norton washers. [7]Hydrotators. [8]American pneumatic separators. [9]Deister-Overstrom "Diagonal-Deck" coal-washing tables. [10]Extra capacity added by rebuilding; original capacity, 300 tons per hour. [11]American pneumatic separators; plant originally designed for installation of dry-cleaning equipment when warranted. [12]Rescreening plant. [13]Two Link-Belt-Simon-Carves washers, each 200 tons per hour. [14]Stump "Air-Flow" coal cleaners. [15]Classifiers to handle breaker water.

coal—¾x0-in. in the case of Edgefield and 1½x0-in. at the Hardy plant. Late in the year, the Allegheny River Mining Co., in Pennsylvania, contracted for a new preparation plant which includes an air-sand unit for treating 2x½-in. coal.

More and more attention is being given in new plant designs to adequate provisions for future installations of mechanical cleaning equipment and expansion of hourly capacity. Such provisions were incorporated in the design of the new Middle Grove plant, in Illinois, and the Indian Head breaker, in the anthracite region, described in the December, 1933, issue of *Coal Age* (pp. 401 and 408). The contract for a new 300-ton per hour tipple for the Panther Coal Co., in West Virginia, also contemplates future installation of both high-speed vibrating screens for sizing slack and mechanical cleaning equipment.

Last year witnessed a pronounced revival of interest in the central-cleaning-plant idea, with three installations of that type. The Acme Coal Cleaning Co. erected such a plant at Avella, Pa., equipped to receive either slack or mine-run in railroad cars and to ship six primary sizes. Over-all capacity of this plant is 550 to 600 tons per hour. The Pittsburgh Coal Co. built a plant at Negley, Ohio, which is so located that it can handle coal from one or more of the river mines in the Pittsburgh district served by the new railroad completed by the coal company last year. The third plant of this type was erected by the Universal Coal Washing Co. at Pinckneyville, Ill., with washery capacity to handle 100 tons per hour of minus 4- and 2-in. coal. Here, too, provision has been made for the future installation of a second washing unit.

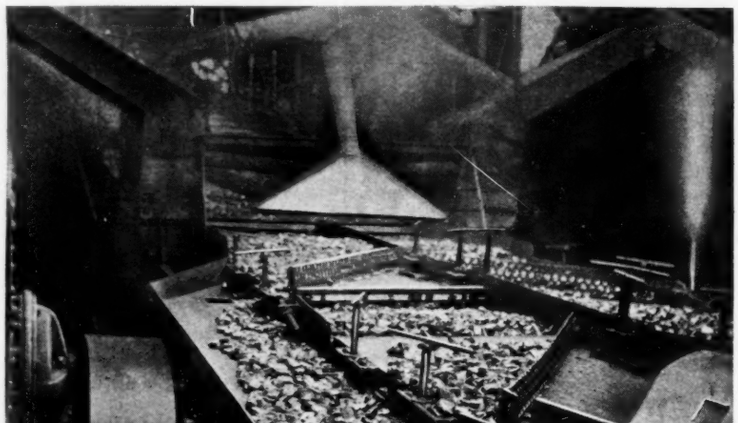
Recent practice in the use of vibrating screens equipped with wedge-wire sieves for drying washed fine coal is illustrated in the Acme plant, where 1¼x¼-in. pea from the desanding and sizing shakers is passed over a "Gyrex" vibrator equipped with wedge-wire sieves with 1-mm. opening. The Acme installation parallels facilities installed at the Ohio plant of the Powhatan Mining Co., where size of coal dewatered and screening facilities are similar, except that the openings in the sieves are $\frac{3}{32}$ in. Reports indicate that the moisture is reduced to a point close to inherent plus film moisture. At the Price Hill Collieries Co., Price Hill, W. Va., a triple-deck "Gyrex" screen has been installed for sizing and drying washed egg, nut and pea. In this case, wire cloth is used instead of wedge-wire sieves; the clear opening in the cloth on the bottom deck is $\frac{3}{16}$-in. Material through this deck is run to waste. The Price Hill plant also is equipped with a vibrator in front of the washing unit for bypassing coal smaller than pea (nominally ⅜-in.).

Experiments were carried on at the Nemacolin (Pa.) plant of the Buckeye Coal Co. in pelletizing filter cake from American filters preparatory to heat-drying on a D-L-O dryer. The filter cake was rolled in a cylindrical drum to form it into small balls which could be handled on the dryer conveyor without disintegration. Last year also saw the development of a new heat dryer by K. R. Bixby, general manager, Midland Electric Coal Corporation. This dryer, installed at the Middle Grove plant, consists of two vertical cylinders 14 ft. in diameter and 28 ft. high. Drying takes place on four circular decks mounted on a central rotating shaft. These decks are pivoted perforated flaps which discharge to the next lower deck every revolution and thereby cause the coal to cascade from top to bottom. Heated air from a stoker-fired furnace at 500 to 700 deg. enters the drying units at the top and follows the coal down the fan inlet to the bottom. The plant is designed for washed ½x$\frac{3}{16}$-in. slack.

Continued interest in briquetting was reflected in the addition of a second Green-Kumerac unit at the Glen Rogers (W. Va.) mine of the Raleigh-Wyoming Mining Co. to supplement the unit installed in 1932. Superior Smokeless Coal & Mining Co. embarked on the operation of a Komarek-Greaves briquetting plant at its Tahona (Okla.) plant. Lehigh Briquetting Co., Leith, N. D., reported an increase in the production of lignite briquets last year. This company is now carrying on experimental work to widen the markets for char and byproduct oils, the latter of which now find an outlet in the wood-preservative and disinfectant industries.

Better illumination is engaging the attention of operators in the Southern high-volatile fields. Reports from those areas indicate that a number of tipples have been equipped with modern lighting for hand-picking, increasing illumination values from as low as ½ foot-candle to 25 to 50 foot-candles. Plants in these fields also have been quite active in installing magnets for removing tramp iron. The Bell & Zoller Coal & Mining Co. installed Cooper-Hewitt type mercury vapor lamps with 450-watt tubes over picking tables in the tipple and rescreening plant at its No. 2 mine in 1933. No trouble was experienced in training pickers, it is stated, and coal and refuse are more easily distinguishable than under incandescent lamps. Also, the eyes are not so much affected, glare is eliminated and the "absence of shadows and reflections is particularly noticeable."

Total capacity of mechanical cleaning equipment installed or contracted for last year exceeded 5,575 tons per hour. This figure covers both anthracite and bituminous installations. Based on an 8-hour day and using the government estimates of 308 and 303.5 days as the theoretical working years for the bituminous and anthracite industries, respectively, mechanical cleaning capacity installed last year approximated 11,212,000 net tons. This brings the total for the six years during which *Coal Age* has been collecting data on these installations to 118,740,000 tons. Inasmuch as it has not been possible to secure reports from every individual operator in the country, this total may be set down as a minimum.



Mechanical Picker at Peabody No. 18 Mine

Total plants installed or contracted for in 1933 for screening and hand-picking methods exceeded 6,770 tons per hour, according to data covering the major part of the building and reconstruction activities collected during the year by *Coal Age*. This total excludes installations of auxiliary coal-handling equipment which does not effect a major change in preparation facilities and, like the mechanical-cleaning capacity, is somewhat under the added capacity actually made available during the past year.

ELECTRIFICATION—

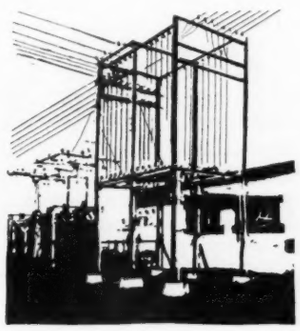
+ Soft Coal Studies Power Use

And Installs Mine Generating Plants

WITH the increased substitution of machinery for man and animal power in the coal industry, expenditures for electric energy have assumed an increasingly important place in the mine cost sheet. Naturally, this rise has been accompanied by corresponding measures for economy in both distribution and application, which have been intensified in the depression years since 1929. In the bituminous industry in 1933, these measures took the form of scheduling of equipment operation to reduce peaks; installation of demand limiters for the same purpose; relocation of substations and revision of d.c. distribution systems to reduce voltage drop and line losses; relocation of service equipment, such as pumps and fans, to cut down air travel, friction losses, etc.; changes in mining plans and operating methods to reduce the quantity of equipment necessary; power-factor correction; installation of mine generating stations to attack power cost at its source; and similar activities.

Scheduling of equipment operation, by reason of the fact that in general it may yield a relatively large saving with comparatively little or no expenditure for equipment, is one of the most popular methods of reducing power cost through cutting down peaks in demand. One simple and time-honored method is to operate cutting machines and pumps at night. Late years, however, have witnessed the adoption of a number of schemes for correlating the operation of equipment required during the day shift. These may consist only of a rule that two haulage locomotives shall not operate over a heavy grade at the same time or may be extended to take in all operations, both underground and surface, as at an Eastern mine.

The control system at the latter operation is based on the use of a demand meter equipped with a special indicator showing visually the course of the demand during any billing period. With this as a basis, the operator is able, through an appropriate control system, to cut off mine activities progressively, beginning with haulage, for as long as may be necessary to prevent the formation of an excessive peak. Experience to date indicates a reduction in demand



ranging up to 40 per cent and improvement in load factor from 30 to 50 per cent, with corresponding influence on energy cost and maintenance of electrical equipment. These savings have been obtained in the face of mechanization of underground loading and surface preparation, progressively heavier grades and other factors tending to increase power requirements. An article describing this system will appear in an early issue of *Coal Age*.

Demand limiters were another means of cutting down peaks adopted by a number of companies last year. In several instances, these were arranged for remote control, either through relays controlling d.c. breakers at the remote substation sets or through relays operating the oil circuit breakers in the a.c. lines feeding the sets. Adaptations of limiter control to both day and night loads also have been worked out. In one case, a limiter with double contacts was installed with a small knife switch for switching from one contact set to another, thus obviating the resetting of the limiter every night and morning.

In addition to other factors, reduction in mine-trip size may materially influence demand. One Eastern operation last year reduced the number of cars hauled by 10-ton locomotives from 20 to 12-14 and installed a signal system to speed up operation. Resultant saving was reported to be well over $100 per month.

The heavy losses frequently encountered in d.c. distribution systems were attacked in 1933 from the standpoint of relocation of substations nearer to load centers and revision of distribution systems. While a large part of the substation relocation work was confined to surface movements, several were placed underground, receiving energy

New Mine Power Plant Construction in 1933

	Firing Method	Boilers—No.	Boilers—Total Capacity, B. Hp.	Generators—No.	Generators—Total Capacity, Kw.
Anchor Coal Co., Highcoal, W. Va.	Stoker	1	303*	..	.....
Ben Franklin Coal Co. of West Virginia, Moundsville, W. Va.	.....	2	600	2	1,500
Harlan Fuel Co., Harlan, Ky.	Stoker	1	252	1	500
Jewell Ridge Coal Corporation, Richlands, Va	Stoker	2	620	2	2,000†
Lillybrook Coal Co., Lillybrook, W. Va.	Stoker	2	1,014	2	1,200
Pikes Peak Fuel Co., Carlton, Colo.	.....	1	586*	..	.....
Princeton Mining Co., Princeton, Ind.‡	Pul. Coal	2	1,000	2	2,000
Wheeling Township Coal Mining Co., Adena, Ohio	Stoker	2	600	2	1,000†

*Addition to existing facilities; Anchor plant destroyed by fire on Dec. 23, 1933.
†Two units of equal capacity, one normally serving as a standby.
‡Construction started in 1932.

through cables laid in trenches cut in the rib or bottom. Distribution circuits were improved through installation of heavier trolley wire, additional or heavier feeder lines and revisions in bonding practice. In the latter connection, last year witnessed a strengthening of the trend toward the short rail bond (8 in., instead of the usual type 24 in. long). A discussion of installation factors and advantages of the short bond appears on p. 77 of this issue of *Coal Age*.

Service activities not directly connected with getting out the coal also came in for attention in 1933. Drainage work included revision of pumping schedules to confine operation to off-peak periods as far as possible, and in this connection sump capacity was increased in a few instances to facilitate such operation. Ditching as a means of eliminating pumping units was employed in some cases, and in others attention was directed toward eliminating long discharge lines by substitution of boreholes. One company, by drilling a borehole directly over the pumping station and installing a 5-in. column line was able to discard 2,000 ft. of discharge line, reduce pump size from 50 to 15 hp. and cut pumping time four-fifths.

Ventilation improvements were directed toward reduction of leakage and resistance losses by cleaning up airways, improving stoppings and doors and relocating fans or displacing them in favor of new and smaller units. At one Eastern operation formerly served by an old-type fan, losses in both the fan itself and through dogholes in the mine had reduced velocity in the working places to almost nothing. At the same time, power input to the fan stood at 86 kw. A smaller unit was purchased and installed near the center of operations, with the result that an ample air supply was assured and power input was cut to 24 kw.

Power-factor correction work at various mines was featured largely by the installation of synchronous motors where feasible, and in a few instances spare synchronous motors were installed to float on the line. At one mine where the latter policy was followed, a 200-hp. motor raised the power factor from 87 to 96 per cent. Capacitors for power-factor correction also received increased attention in 1933, which was reflected in an installation at a Southern mine yielding a saving of approximately $600 per month for an investment of $8,500.

Town lighting represents a power expenditure that frequently is regarded as a necessary evil and as such not subject to the checks placed on other consumption. In one Eastern region, however, the utility company has embarked on a campaign designed either to help the operator recover a greater proportion of the expenditures for this service through a survey of lighting facilities or to relieve him entirely of this burden by taking over the system.

Interest in the reduction of purchased-power cost went hand-in-hand with investigations into the possibilities of mine-generated power in 1933. According to available records, six new mine plants (including one on which construction was started late in 1932) were built last year, with an aggregate generating capacity of 8,020 kw.-hr. In addition, at least two plants were reported to have added additional boiler equipment, and others embarked on modernization of firing methods.

One of the two largest 1933 plants was that of the Jewell Ridge Coal Corporation, located on the Clinch River at Richlands, Va., 6.6 miles away from the mine. Installation of this plant was the result of several years' consideration of the power problem, supplemented by engineering studies of present mine loads and possible future expansion. Lack of water at the mine dictated the Clinch River location and the fuel (merchantable slack, charged at prevailing market prices) is shipped in in railroad cars. Major equipment consists of two Union Iron Works 310-hp. boilers, Westinghouse underfeed stokers, two Westinghouse 1,250-kva. (1,000-kw. at 0.8 power-factor) turbo-generators, one of which normally is a standby unit. The plant operates condensing, and savings are expected to return the investment in five years, figuring interest at 6 and depreciation at 5 per cent. On the same basis, unit energy cost is expected to be 8½ mills per kilowatt-hour.

Lillybrook Coal Co., Lillybrook, W. Va., shifted its mine load (aggregating at times more than 400,000 kw.-hr. per month with 15-minute peaks running up to 700-1,000 kw.) to a $125,000, 1,200-kw. generating plant in September, 1933. Construction of the Lillybrook plant also was based on investigations extending over several years, coupled with forecasts of future activity. Available water supply consisted of a 2,000-g.p.m. stream draining from one of the mines, which analysis showed was reasonably suitable for boiler use. The quantity, however, was insufficient for condensing operation without the construction of storage, cooling or spraying facilities. Consequently, it was decided to omit this feature. The design, however, provides for the installation of additional boiler equipment if warranted by future developments, while holding present plant capacity and initial investment to a minimum. Two 507-hp. Babcock & Wilcox Type H Stirling boilers. Detroit stokers and two 750-kva. alternators driven by Skinner "Universal Unaflow" engines comprise the major equipment. Fuel consists largely of machine-cuttings, supplemented by track cleanings and reject coal. Provision is made for the use of mine-run in case the regular supply is insufficient.

Princeton Mining Co., Terre Haute, Ind., started up a new mine power plant at its Kings Station mine, Princeton, Ind., on July 15, equipped with two 500-hp. boilers, "Unipulvo" pulverized-coal firing system and two 1,000-kw. turbo-generators. Fuel consists of 1¼-in. screenings, and savings were originally estimated at $25,000 per year. Detailed descriptions of the Jewell Ridge, Lillybrook and Princeton plants will appear in early issues of *Coal Age*.

In Kentucky, the Harlan Fuel Co. built a plant at its Yancey mine, equipped with a 252-hp. Combustion Engineering Co. VM-Type bent-tube boiler, Detroit stoker, and a 625-kva., 500-kw., General Electric alternator driven by a Skinner "Universal Unaflow" engine. Fuel consists of nut-and-slack with a large proportion of minus ¼-in. refuse coal. Ben Franklin Coal Co. of West Virginia installed a plant at Moundsville, in the northern West Virginia Panhandle, equipped with two 600-hp. boilers and two 750-kw. turbo-generators.

Late in 1933, the Wheeling Township Coal Mining Co. completed a new power plant at its Somers mine, Adena, Ohio. The plant, which operates condensing, is equipped with two 300-hp. Stirling-type boilers, Babcock & Wilcox forced-draft stokers and two 500-kw. Allis-Chalmers turbo-generators, one of which is a standby.

WAGE STABILIZATION

+ Brings Union Back to Power

In the Bituminous Industry

IN A YEAR marked by unprecedented progress toward stabilization in the bituminous industry under the aegis of the National Industrial Recovery Act, wage liquidation, which went hand in hand with the price liquidation growing out of bitter and unregulated competition in recent years, came to an end in 1933. Most of the major wage revisions took place in the Appalachian region, where Appalachian Coals, Inc., initiated measures in May to stop the downward course of wages and to achieve some degree of stability. Similar voluntary efforts in most of the other Eastern fields, at that time largely non-union, followed immediately. Still higher rates were filed by these groups in proposed codes, and the basic rates finally agreed on in the formulation of the bituminous code represented an additional advance of 76c. per day over original code minima, as well as increases ranging up to 200 per cent, in some cases, over rates prevailing early in the year.

In negotiations leading up to the bituminous code, Appalachian producers also accepted the principle of union operation. This acceptance on the part of operators who had abandoned or who never had had contractual relations with the union was due in part to pressure applied by the NRA, which favored an agreement as the best means of relieving the administration of the delicate task of fixing wage differentials.

The stage for this major change in industrial relationships east of the Mississippi had been set by a swift organization campaign inaugurated by the United Mine Workers as soon as it appeared certain that the proposed NIRA would be enacted by Congress. Although operators in some non-union fields appealed to their men to continue existing relationships and made some attempts to enroll workers in company unions, commercial mine management in the Appalachian region, following both the spirit and the letter of the new law, made no effort to interfere with organization activities.

Signing of the Appalachian agreement, which went into effect on Oct. 2, 1933, and presaged agreements in non-

Bituminous Districts Established by the United Mine Workers in the United States.

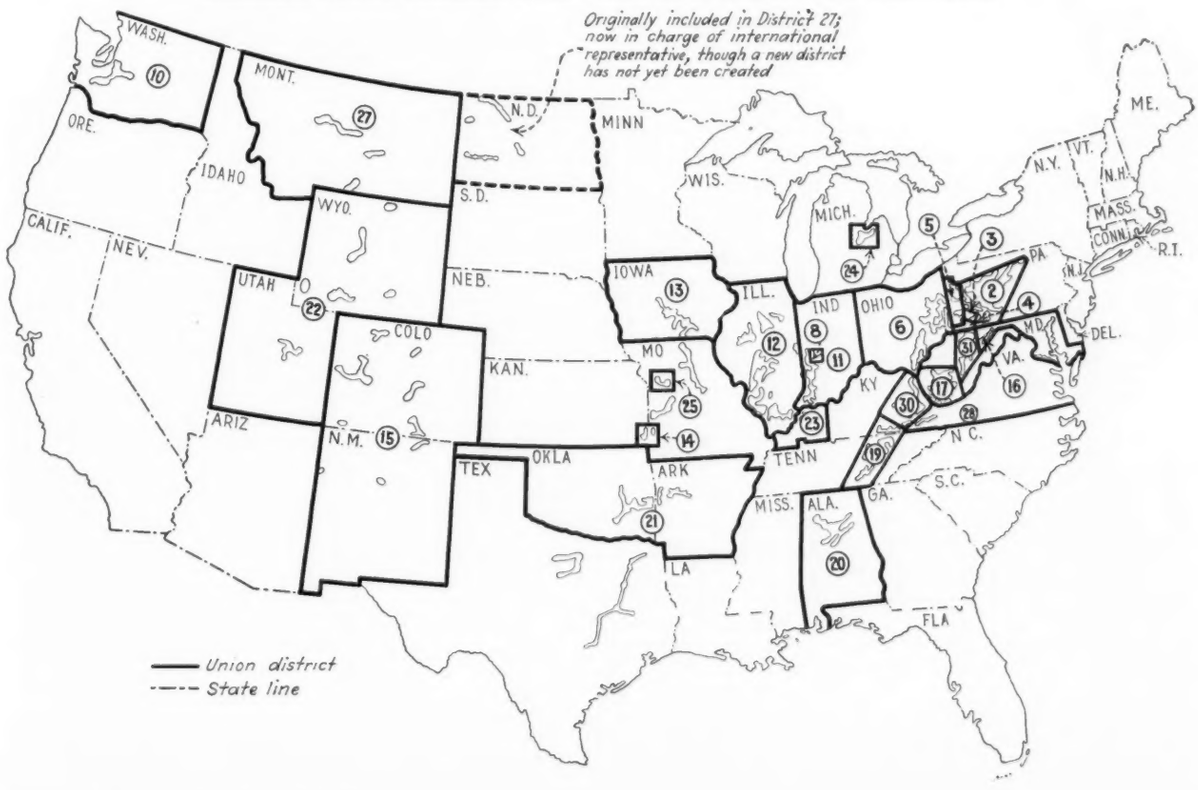


Table I—Hourly Rates for Inside Day Labor Included in Union Contracts for Various Bituminous Fields, in Cents Per Hour

(Does not include machine-loading scales. Union districts corresponding to the respective fields are shown in parentheses)

Classification*	Ark.-Okla. (21)	Nor. Colo. (15)	So. Colo.-New Mexico (15)	Illinois (U.M.W., 12; P.M.A., 1)	Indiana (11)**	Wayne & Appanoose, Iowa (13)	Other Iowa (13)	Kan.-Mo. (14)†	So. High- and Low-Vol. (30, 28, 19, 17, 16)‡	Michigan (24)	Ray & Clay Counties, Missouri (25)	Montana (27)	Ohio, Pa., No. W. Va., Panhandle (2, 3, 4, 5, 6)§	Utah (22)	Washington (10)	No. W. Va. (31)	No. & So. Wyoming (22)
Basic scale***	46 7/8	1 65 3/8	1 58 3/4	62 1/2	57 1/2	57	58 3/4	46 7/8	52 1/2	57 1/2	46 7/8	70 3/8	57 1/2	68	67 1/2	54 1/2	67 3/4
Bonders				62 1/2					52 1/2				2 57 1/2			54 1/2	67 3/4
Brakemen									3 52 1/2				2 57 1/2			54 1/2	66
Bratticemen									4 52 1/2			71 7/8	6 57 1/2	68		54 1/2	
Cagers	46 7/8			62 1/2		57	6 58 3/4	46 1/8	3 52 1/2	57 1/2	46 7/8		57 1/2	70	7 62 1/2	7 54 1/2	
Couplers				8 59 3/8					9 52 1/2							51 1/2	
Couplers, boys	34 3/8					41 7/8	41 7/8	34 1/4				34 1/4	51 7/8	44			43 1/2
Drillers, coal			58 1/4					46 7/8	52 1/2				71 1/4	72		54 1/2	75
Helpers									9 49 1/2				67 7/8	66			
Drillers and shooters	50 1/2						58 3/4	46 7/8									
Driliers, rock									54 1/2				10 59 1/2				
Drivers	46 7/8		58 1/4	11 62 1/2		57	6 58 3/4	12 46 7/8	52 1/2	57 1/2	46 7/8	70 3/8	57 1/2	68	62 1/2	54 1/2	67 3/4
Spike team					60 1/4		60 3/8					71 7/8	13 60 3/8				
Engineers												67 7/8			66 3/4		67 3/4
Elec. or steam slope or auxiliary	46 7/8														60		
Examiners, mine				75							51 3/8						
Firebosses	53 3/4	68 3/4															
Flaggers				37 1/2					32 1/2			51 7/8	23 7 1/2				.80
Gas men								51 7/8			51 3/8						
Greasers		47 1/2							32 1/2			51 7/8	23 7 1/2			34 1/2	
Greasers, boys	34 3/8							34 1/4			34 1/4			44			43 1/2
Handlers, slate and rock				59 3/8							46 7/8						
Hoistmen			58 1/4											70			
Machine haulers	46 7/8			62 1/2				46 7/8		57 1/2	46 7/8		14 57 1/2				
Machine runners	53 1/4	68 3/4			15	63 7/8	63 7/8	51 5/8	16 54 1/2	61	48 7/8	73 1/4	17 65 7/8	18 80			85
Helpers	49 1/8	65 5/8			15	60 3/8	58 3/4	48 3/4	9 52 1/2	61	46 7/8	67 7/8	19 66 7/8	18 75			75
Masons			58 1/4											70			67 1/2
Miners by the day	50 1/2						60	20			46 7/8	72 1/2	21 57 1/2		67 1/2		67 3/4
Miners taken from face							58 3/4	49 3/8	52 1/2	61	46 7/8		22 57 1/2	69		54 1/2	68 1/2
Motormen	46 7/8		58 1/4	11 67 1/2	64 1/4	60 3/8	60 3/8	51 5/8	54 1/2	60		70 3/8	59 1/2	70	62 1/2	56 1/2	67 3/4
Muckers									9 40					66			
Nippers		56 1/4										67 7/8		66			
Oilers		47 1/2		8 59 3/8		37 1/2	37 1/2										
Pipemen, head or 1st												71 3/8			67 1/2		
Pipemen				59 3/8		57 3/4		46 7/8	9 49 1/2	57 1/2	46 1/8	67 7/8		68	61 1/4		
Helpers									9 40						58 3/4		
Pumpmen	46 7/8						50		49 1/2	57 1/2		71 5/8	23 54 1/2	66	58 3/4	51 1/2	66
Pushers	46 7/8					55 5/8		46 7/8			46 7/8						
Repairmen, machine												71 7/8		70			
McGinty												71 7/8					67 3/4
Rockmen														68			
Roperiders			58 3/4									67 7/8		68	62 1/2		67 3/4
Ropesplicers												71 7/8					
Shotfirers	53 1/4	68 3/4		75	24 76 7/8			51 5/8	9 54 1/2		51 5/8	71 1/4		75		54 1/2	75
Sinkers, shaft	60	68 3/4	62 1/2	68 3/4			60 3/8	46 7/8			50 3/8	73 1/8					
Snappers									3 52 1/2				10 57 1/2				
Spraggers				8 59 3/8					52 1/2				23 57 1/2				
Spraggers, boys	34 3/8							34 1/4			34 1/4						
Switchthrowers				37 1/2					32 1/2				23 7 1/2				
Switchthrowers, boys														44			
Timbermen, head							25 58 3/4							70			
Timbermen	46 7/8		58 1/4	62 1/2			58 3/4		52 1/2	57 1/2	46 7/8	72 1/2	57 1/2	68	67 1/2	54 1/2	67 3/4
Helpers							55 5/8		49 1/2			67 7/8	23 54 1/2	66	58 3/4	51 1/2	
Trackmen	46 7/8		58 1/4	62 1/2		58 3/4	58 3/4	46 7/8	52 1/2	59 3/8	20 46 7/8	72 1/2	57 1/2	68	67 1/2	54 1/2	67 3/4
Helpers	43 1/4						55 5/8	44 1/2	49 1/2	55 1/2	44 1/2	67 7/8	54 1/2	66	58 3/4	51 1/2	
Trappers	25 5/8	42 1/2		37 1/2	32 5/8	37 1/2	37 1/2	24 7/8	32 1/2		24 7/8	43 1/4	27 37 1/2	44	42 1/4	34 1/2	43 1/2
Tripriders	46 7/8			11 62 1/2	58 3/8	57	6 58 3/4			57 1/2	46 7/8		14 57 1/2				66
Water haulers	46 7/8			62 1/2			58 3/4	46 7/8		57 1/2	46 7/8		14 57 1/2				
Wiremen			58 1/4	62 1/2					52 1/2				57 1/2	70		54 1/2	
Helpers									49 1/2				23 54 1/2	66		51 1/2	
Other inside labor	43 3/4			59 3/8	57 3/16	55 5/8	55 5/8		49 1/2	55 1/2	44 1/2	67 7/8	54 1/2	66	58 3/4	51 1/2	66

*Scales for various classifications not specifically shown are as follows: Arkansas-Oklahoma——electric hoist operators, boys, 38½c.; fire runners, 46⅞c.; head machinists, 54½c.; machinists, 49⅜c.; men driving slopes, 50½c.; tail-rope engineers, 44c.; boys, 38½c.; southern Colorado-New Mexico—linemen, 58¾c.; Illinois—blockers and empty-car pullers, shaft bottom, 59⅜c.; electricians repairing large loading and cutting machines, 75c.; electricians' apprentices and helpers, grippers, conveyor repairmen, 62½c.; throwing horsebacks back from face, conveyor mining, 71¼c.; men handling horsebacks second time, stoppings builders, 59⅜c.; rock shooters, 68¾c.; shaft sinkers (shift leaders), 73⅝c.; Iowa (outside Wayne and Appanoose)—shovelers, 60⅝c.; bumpers, minimum, 55⅝c.; Kansas-Missouri—airmen, 46⅞c.: Southern High- and Low-Volatile Fields—bonders' helpers, except Harlan and Southern Appalachian fields, 52½c.; bratticemen's helpers, Big Sandy-Elkhorn, Harlan and Southern Appalachian fields, 49½c.; doodlers and ginmen, Harlan and Southern Appalachian fields, 40c.; rock-loader operators, Big Sandy-Elkhorn, 54½c.; helpers, 52½c.; Michigan—crab operators, 57⅜c.; Ray and Clay Counties, Missouri—rail setters, coal spraggers, brushing top and lifting bottom, 46⅞c.; Montana—barnmen, 68¾c.; parting and connection men, 67⅞c.; head cagers and main rope riders, 71⅞c.; pick carriers, 51⅞c.; pulley repairers, 70c.; Utah—dummy makers, 44c.; head rockmen and trackmen (optional, one per mine), 70c.; rollermen 68c.; sprinklers, 66c.; Washington—1st class electricians and machinists, 67½c.; 2d class, 61¼c.; parting boys, 42¼c.; timber packers, 58¾c.; northern West Virginia—bratticemen's helpers, 51½c.; Wyoming—barnmen, 63½c.; electricians, 69½c.; timber pullers (southern Wyoming only), 75c.

**Does not include the Brazil Block field (District 8) or the temporary adjustment in Vanderburg and Warrick counties.

†Cherokee and Crawford counties, Kansas; Barton County, Missouri.

‡Includes the following fields: Kentucky—Big Sandy-Elkhorn and Hazard (30), Harlan (19); Kentucky-Tennessee—Southern Appalachian (19); southern West Virginia—Greenbrier, Kanawha, Logan, New River, Pocahontas-Tug River, Williamson and Winding Gulf (17); Virginia (28); also Maryland-West Virginia—Georges Creek-Upper Potomac field (16).

§Includes the following fields: Ohio—Hocking, Coshocton, Massillon, eastern Ohio (6); Pennsylvania—central and Somerset County (2); western Pennsylvania (3, 4, 5); northern West Virginia Panhandle (6).

***With the exceptions noted, basic scales correspond in each field to those established in the bituminous coal code.

[1]Basic scales included in the bituminous code: northern Colorado, 62½c.; southern Colorado, 55½c.; New Mexico, 56c. [2]Specific rate not included in the Hocking, eastern Ohio and northern West Virginia Panhandle agreements. [3]Specific rate not included in the Harlan and Southern Appalachian agreements. [4]Big Sandy-Elkhorn, Harlan and Southern Appalachian only. [5]Eastern Ohio, 54½c.; specific rate not included in Coshocton, Massillon, central Pennsylvania, Somerset and western Pennsylvania agreements. [6]Subdistrict No. 4, 58¼c. [7]Assistants and helpers: Washington, 58⅜c.; northern West Virginia, 51½c. [8]Shaft bottom. [9]Harlan and Southern Appalachian only. [10]Specific rate not included in eastern Ohio and northern West Virginia Panhandle agreements.

[11]Handling man trips, 45c. extra per day. [12]For each additional mule, 9c. extra per day. [13]Hocking only. [14]Hocking, eastern Ohio and northern West Virginia Panhandle only. [15]Chain-machine operator and helper, 63¼c.; puncher operator, 65⅜c.; helper, 57⅞c.; rate applies only to opening new mines and deficient coal.

[16]Specific rate not included in Georges Creek-Upper Potomac agreement. [17]Coshocton and Massillon; eastern Ohio and northern West Virginia Panhandle, cutting and/or shearing machine, 75c.; shortwall or breast machine, isolated or deficient sections or temporary work, 59½c.; specific rate not included in other agreements. [18]Cutting, shearing and drilling machine runners, 85c.; helpers 75c. [19]Coshocton and Massillon only. [20]Rates: after machine and clean-up, 46⅞c.; digging coal, 49⅝c.

[21]Reopening old workings, central Pennsylvania and Somerset only. [22]Western Pennsylvania only. [23]Specific rate not included in Hocking agreement. [24]Pick mines, 93⅜c. [25]Subdistrict No. 4. [26]Trackmen with machines, 44½c. [27]Hocking district, old men, 40⅝c.

Table II—Hourly Rates for Outside Day Labor Included in Union Contracts for Various Bituminous Fields, in Cents Per Hour

(Union districts corresponding to the respective fields are shown in parentheses)

Classification*	Ark.-Okla. (21)	Nor. Colo. (15)	So. Colo.-New Mexico (15)	Illinois (U.M.W., 12; P.M.A., 1)†	Indiana (11)‡	Wayne & Appanoose, Iowa (13)	Other Iowa (13)	Kan.-Mo. (14)‡	So. High- and Low-Vol. (30, 28, 19, 17, 16)‡	Michigan (24)	Ray & Clay Counties, Missouri (25)	Montana (27)	Ohio, Pa., Nor. W. Va. Panhandle (2, 3, 4, 5, 6)‡	Utah (22)	Washington (10)	Nor. W. Va. (31)	Nor. & So. Wyoming (22)
Basic scales§	[1]38⅞	153½	46⅞	50	52½	48½	50	[1]40⅞	40	[1]52½	[1]40⅞	60¼	45	56	[1]51¼	42	[2]55½
Bit sharpeners									43				348			45	
Blacksmiths, head & 1st	53¾							51⅝	454½		51⅝		559½	74	70	62½	72½
2d Class								48¾			48¾		657½		61¼	57	
Blacksmiths	49⅜	66⅞	58¾	58⅜	55⅜	58¾	58¾		754½	60		73¾	857½	68			67½
Helpers	43¾	52½	50	52½				44½	443		44½	62⅛	952½	60	56¼		58½
Box-car loader operators		62½												65			64½
Box-car shovelers												64½					62½
Car cleaners									[3]40				345				
Car droppers		56¼	50						[3]43				48	60	56¼		
Carpenters, head & 1st														70	70		
Carpenters	44⅞		56¼	54⅞—62½						58¼	45¼	73⅛	[4]52½	70	60		68¼
Helpers														60	51¼		
Couplers			46⅞			41⅞			[5]43½			51⅞	[6]37½	56	38⅛		
Drivers							50					63					
Drum runners			56¼						754½								
Dumpers			50				50		1443	55½			48	62	56¼	45	
Electricians, 1st class												73¾			67½		
2d class												68⅜			61¼		
Electricians & mechanics			58¾											70			69½
Engineers, 1st class	47⅞	65⅛		15	15		15	15			15	74⅛	857½				
2d class	44⅔	62½		15	15		15	15			15	68⅜	854½				
3d class	40⅔	62½		15	15		15	15			15		851½				
Hoisting			58¾			59⅜	59⅜		[7]54½	61¾	[7]45⅜		[8]57½	75	66¼	63½	75
And firemen, combination		62½			15				445							54½	
And power-house combination			58¾													[9]54½	
Power-house									450				[10]57½		61¼		15
Slope											15					57½	
Tail rope	46⅞					48¼	51⅜				15						
Fan men									[11]40							[12]22	
Firemen		62½	50⅜		[13]45⅜10		50	40⅞	1640	55½	40⅞	66⅜	[14]54⅜		58¾	56½	[15]61¼
Greasers									732½			51⅞	837½		38⅛	34½	43½
Hoistmen, inclined rock dump								40⅜			41⅞						
Lampmen		53½												63	58¾	[16]49	
Loaders, open-top cars							[17]50								51¼		
Machinists						58¾	58¾				49⅝	73¾		[18]70	67½		[19]69½
Masons & bricklayers												68⅜					67½
Miners taken from face											46⅞		[20]57½				[21]68½
Motormen									[22]47½			71¼					
Oilers			46⅞			37½			732½			63					
Pickers	25	52½							32½			60¼	[23]37½	50	51¼	34½	
Pickers, boys	21⅞	39¼		37½ & 50		37½	37½	29⅞			29⅞	43¾		44	40⅝		43½
Pipemen														68			67½
Repairmen, car		56¼	50⅝	54⅞—60½			50		43			68¾	48	62	57½	[24]54½	59¼
Repairmen, electrical, 1st									[25]54½								
Sand dryers									40				[26]45			42	
Spraggers						41⅞			732½								
Teamsters			46⅞				50		1640			63⅝		60	56¼	42	[27]58½
Timbermen									732½								
Tipplemen		56¼	46⅞									62¼	[28]48	62		45	59½
Tool sharpeners												71⅞		68			
Trimmers, car									43	55½			48				
Truck drivers									1640			63⅝		60	56¼	42	[27]58½
Washer operator			50												58¾		
Welders														70			69½
Other outside labor	38⅞	50	46⅞	50	52½	48¼	50	40⅞	40	52¼	40⅞	60¼	45	56	51¼	42	255½

*Scales for various classifications not specifically shown are as follows: southern Colorado-New Mexico — electricians' and mechanics' helpers, 56¼c.; dinkey and locomotive engineers, linemen, 58¾c.; knucklemen, 48¾c.; lump box-car loaders, 50c.; slate pickers, able-bodied, 46¼c.; others, 41¼c.; Iowa (outside Wayne and Appanoose counties)—chunkers, 50c.; Southern High- and Low-Volatile Fields—tipple oilers, Big Sandy-Elkhorn, 40c.; tram drivers, Harlan, Southern Appalachian, 43c.; ginmen, car pushers, yardmen, 32¼c.; Montana—barnmen, 15 or more horses, $152.40 per month; under 15 horses, $140; assistants, $131.50; head brakemen, 65¾c.; brakemen, 62¼c.; coal inspectors and timber framers, 63c.; drill boys, minimum, 46c.; head dumpers, 63¾c.; fan firemen, water tenders, 66¾c.; rope cutters, 63¾c.; Utah—armature winders, 72c.; head car droppers (optional), car repairmen's helpers, 62c.; boy couplers and car oilers, 44c.; cart drivers, men car oilers, 56c.; mechanics and shovel operators, 70c.; mechanics' assistants, head car repairmen (optional), 66c.; mechanics' helpers, 62c.; pipemen's helpers and prop sawers, 60c.; prop sawers' helpers, 56c.; rope riders, 68c.; shaker and spiral runners, 65c.; Washington—electricians' and machinists' helpers, choppers, head pickers, 56¼c.; 2d class machinists, 61¼c.; lampmen (2d class), jig and table runners, 53¾c.; development engineers, bunker machinery tenders, cagers, 58¾c.; cagers' helpers, 2d class washer operators, 56¼c.; northern West Virginia—1st class repairmen, 62¼c.; 2d class, 57c.; helpers, 42c.; coaling-station operators, 45c.; wheelmen, 56¼c.; helpers, 54¼c.; Wyoming—boiler makers, 73¼c.; night watchmen, 55c.

† Specific outside day rates not set forth in general Illinois agreements; examples only given.

‡ See footnotes, Table I, for districts included in this group.

§ With the exceptions noted, basic scales correspond in each field to those established in the coal code.

[1]Basic scales in coal code: Arkansas, Oklahoma, Kansas, Missouri, 41c.; northern Colorado, 46¼c.; Michigan, 45c.; Washington, 50c. [2]Northern Wyoming, 56¼c. [3]Specific rate not included in Hocking agreement. [4]Big Sandy-Elkhorn only. [5]Eastern Ohio, northern West Virginia Panhandle; Hocking 57¼c.; specific rates not included in other agreements.

[6]Eastern Ohio, northern West Virginia Panhandle; Hocking, 54¼c.; specific rates not included in other agreements. [7]Harlan, Southern Appalachian only. [8]Coshocton, Massillon only. [9]Eastern Ohio, northern West Virginia Panhandle; Massillon, 54¼c.; specific rates not included in other agreements. [10]Not included in Harlan, Southern Appalachian agreements.

[11]Eastern Ohio, northern West Virginia Panhandle; Hocking, 54¼c.; specific rates not included in other agreements. [12]Harlan, Southern Appalachian only, supply-motor coupler; yard coupler, 32¼c.; [13]Hocking, 45c.; specific rates not included in central Pennsylvania, Somerset and western Pennsylvania agreements. [14]Slate dumper, Harlan, Southern Appalachian, 32¼c. [15]Engineers' scales: Illinois—over 500 tons per day, 1st, 2d and 3d class, respectively, $163.10, $153.76, $149.10 per month; 200-500 tons, 1st, $158.42; 2d and 3d, $149.10; 100-200 tons, 1st, $158.42; 2d, $146.76, nine-hour day; under 100 tons, $144.42, nine-hour day; Indiana—1st (8 hours), $146.57; 2d, $138.23; 3d, $134.06; Iowa—1st, 2d and 3d classes, respectively, $144.13, $138.52, $128.26; tail-rope, $128.26; Kansas-Missouri—1st, 2d and 3d, respectively, $108.12, $102.86, $95.86; tail-rope, 62½ to 64¼c., or $129.78 to $133.66 per month; slope, 46¼ to 48¼c., or $97.34 to $100.25; Ray and Clay counties, Missouri—steam hoisting engineers, same as Kansas-Missouri; tail-rope and slope engineers, minimum 39 8/9c. per hour, $93.02 per month; maximum, 42 8/9c., $100.43; Wyoming—powerhouse (not including substation attendants), $142.

[16]Big Sandy-Elkhorn, Harlan, Southern Appalachian only. [17]Electric shaft hoist engineers, dynamo tenders and night hoistmen only; see Note 15. [18]Minimum, electric hoist engineers, Hocking only; steam hoisting engineers, same district, 65¾c. [19]Combination powerhouse and man-hoist engineer. [20]Hocking only.

[21]Combination substation attendant-fan man, Big Sandy-Elkhorn only. [22]Combination fan man-substation attendant, 44c.; also combination fan man, substation attendant and fireman. [23]Per month, 10-hour day, $131.25; night fireman, 12 hours, 37½c. per hour, $129.95 per month. [24]Northern Wyoming, 62¼c. [25]Combination lampman and man-hoist engineer.

[26]Also box-car loaders. [27]Assistant machinists, Utah, 66c.; machinists' helpers, Wyoming, 60¼c. [28]Coshocton, Massillon, eastern Ohio, northern West Virginia Panhandle only. [29]Northern Wyoming, 67¾c. [30]Supply motormen, Harlan, Southern Appalachian only.

[31]Hocking, 45c. [32]Helpers, 42c. [33]Big Sandy-Elkhorn only: 2d class repairmen, 49½c.; helpers, 43c. [34]Northern Wyoming, 59¼c.

union Colorado, New Mexico and Utah, as well as the resumption of relations temporarily severed in Michigan, Wayne and Appanoose counties, Iowa; and commercial mines in Washington, brings the United Mine Workers up to a position of power probably greater than any ever attained in its history, even in the general strike of 1919, when the organization was able to tie up 71.6 per cent of the actual productive capacity of the bituminous mines of the country.

Prior to Oct. 2, the union sway in the soft-coal fields was confined to: Arkansas; one Colorado company; Illinois, where its power is challenged by the Progressive Miners of America; Indiana, in part non-union in late years; Iowa and Michigan, except as noted above; Missouri, part; Montana; Ohio, Hocking and Tuscarawas districts; Oklahoma, part; a few companies in western Pennsylvania; Washington, except as noted above; a majority of the northern West Virginia producers; and Wyoming. The Arkansas, Oklahoma, Ohio, Pennsylvania and northern West Virginia groups represented returns to the fold in 1932 and 1933.

Through the Appalachian agreement, the United Mine Workers gained control over the majority of the miners in the following fields (including districts covered by previous agreements): Kentucky—Big Sandy-Elkhorn, Harlan and Hazard; Kentucky-Tennessee—Southern Appalachian; Maryland-West Virginia—Georges Creek-Upper Potomac; Ohio—Hocking, Coshocton (including Tuscarawas), Massillon and eastern Ohio; Pennsylvania—central and western; Virginia; West Virginia—northern West Virginia, northern Panhandle and the Greenbrier, Kanawha, Logan, New River, Pocahontas-Tug River, Williamson and Winding Gulf high- and low-volatile fields in southern West Virginia. With the exception of Ohio, central Pennsylvania, the Pittsburgh district of western Pennsylvania, northern West Virginia and the Panhandle district, union control was never supreme in any Appalachian field in the past.

Other agreements covering non-union operations signed as a result of the adoption of the bituminous code include the following fields: Colorado, New Mexico, southern Tennessee and Utah. The New Mexico and Utah agreements followed the routing of the Communist National Miners' Union, which staged bitter midsummer strikes in both States. The strategy of western K ntucky operators in furthering an independent union, coupled with a flat refusal to deal with the United Mine Workers, resulted in an inconclusive tilt with the National Labor Board, which was featured by an abortive attempt to hold a hearing on Oct. 12. Since that time, however, Ohio and Muhlenberg County operators have entered into an agreement with the United Mine Workers.

Captive-mine owners in western Pennsylvania also frowned on union organization, and Presidential intervention was necessary to halt the resultant strikes and riots. With one exception, steel-company affiliates, while conceding the right of the miners to name their own representatives for collective bargaining, continued to refuse direct recognition of the United Mine Workers. No final settlement of the controversy, which has shuttled back and forth between union, the mines, the National Labor Board and the White House, had been reached by Feb. 1, 1934.

Inside and outside day labor rates included in union contracts (except southern Tennessee and western Kentucky, for which copies were not available) are shown in Tables I and II in cents per hour. Table III sets forth day rates for mechanical loading established in various fields, and Table IV shows the Indiana and Illinois strip-mining scales. Tonnage and deadwork

(Turn to page 73)

Table III—Day Scales for Mechanical Loading Established in Union Agreements for Various Districts

(Union districts corresponding to the respective fields are shown in parentheses)
[Rates are stated in cents per hour]

	Ill. (U. M. W. 12; P. M. A. 1)	Indiana (11)	Georges Creek-Upper Potomac (16)	Ray & Clay Cos., Missouri (25)	Montana (27)	Coshocton, Ohio (6)	E. Ohio, Nor. W. Va. Panhandle (6)	West Pa. (3, 4, 5)	Utah (22)	Washington (10)	Nor., W. Va. (31)	Wyoming (22)
Brushers or trimmers	....	....	....	....	....	....	....	....	....	....	....	[1]75
Face men	71¼	....	....	....	77½	....	57½	....	....	70	....	[2]75
Conveyors:												
Chunkers	....	....	....	50½	....	....	....	....	....	....	....	....
Cutters	....	....	[3]54½	....	....	....	....	....	....	....	....	....
Loaders and/or shovelers	71¼	84⅜	[3]54½	50½	77½	....	....	....	....	70	....	75
Operators	....	....	....	50½	....	....	....	....	....	70	....	....
Duckbill	....	....	....	....	82½	....	....	....	....	75	....	80
Other crew members	....	....	[3]52½	....	....	....	....	....	....	....	....	....
Cutting Machines:												
Operators:												
Arcwall	....	....	....	....	92½	....	....	....	....	....	....	....
Cutting Machines	87½	84⅜	....	....	84¾	....	75	....	80	80	70	[1]85
Helpers	87½	84⅜	....	....	84¾	....	....	....	75	....	70	[1]75
Shearing machines	75	84⅜	....	....	84¾	....	75	....	....	....	....	....
Helpers	[4]75	84⅜	....	....	84¾	....	....	....	....	....	....	....
Shearing and drilling	....	....	....	....	92½	....	....	....	....	....	....	....
Cutting and shearing	....	....	....	....	....	....	....	72½	....	....	....	....
Helpers	....	....	....	....	....	....	....	72½	....	....	....	....
Cutting, shearing, drilling	....	....	....	....	....	....	....	....	85	....	....	....
Helpers	....	....	....	....	....	....	....	....	75	....	....	....
Cutting and loading	....	....	....	....	....	66⅞	....	....	....	....	....	....
Drillers	71⅞	76⅞	....	....	77½	....	....	[5]63½	....	72½	....	[1]75
Helpers	....	....	....	....	....	....	....	[5]54½	....	....	....	....
Drivers	....	....	....	....	....	....	....	....	....	....	....	[1]67¾
Entry-driver operators	87½	....	....	....	....	....	....	....	....	....	....	....
Handlers, rock and material	....	....	....	....	....	....	....	....	....	....	....	66
Maintenance men	....	....	....	....	70¼	....	....	....	....	....	....	....
Mechanical Loaders:												
Operators, coal	87½	84⅜	....	....	[6]91¼	....	75	[7]72½	85	....	75	90
Helpers	[8]78⅛	84⅜	....	....	[6]78¾	....	61	[7]59½	75	....	60	75
Operators, rock	75	75	....	....	....	....	65½	....	....	....	....	....
Pit-car loaders	71¼	....	....	....	....	....	....	....	....	....	....	....
Scraper Loaders:												
Operators	....	....	....	....	[9]91¼	....	....	....	....	....	....	90
Helpers	....	....	....	....	78¾	....	....	....	....	....	....	75
Shooters or shotfirers	71⅞	76⅞	....	....	77½	....	....	....	75	....	....	[1]75
Snubbers	71⅞	76⅞	....	....	....	....	....	....	....	....	....	....

[1]Northern Wyoming only. [2]Southern Wyoming only. [3]Mines of the Consolidation Coal Co. [4]Progressive agreement only. [5]Track-mounted drilling machine. [6]Jeffrey combination loader, 82½c.; helper, 77½c. [7]44-C operator, 69c.; helper, and preparation man, 59½ c. [8]Progressive scale, 78½c. [9]Small scraper loaders, 77½c.

Table IV—Union Scales for Strip Mining, Indiana and Illinois

	Indiana	Illinois
	[Cents per hour]	
Blacksmiths	62½	77½
Helpers	58⅝	71⅝
Boiler makers	62½	....
Coal cleaners, dirt shovelers	57⅜16	62½
Channeling machine operators and helpers	69⅞	....
Couplers	55⅛	....
Ditchers	57⅜16	....
Drillers, coal	.....	64¾
Overburden	.....	62½
Helpers	.....	62½
Drillers, churn and hand, machine power	57⅜16	....
Surface power	68⅞16	....
Helpers	57⅜16	....
Drivers	57⅜16	....
Dumpers	54⅛	....
Electricians	69⅞	75
Apprentices and helpers	57⅜16	62½
Groundmen	57⅜16	64¼
Haulage engineers, motormen	64¼	....
Hostlers, night	.....	64¼
Loading shovel, engineers	.....	[1]83⅜
Firemen	.....	77½
Locomotive engineers	.....	81½
Firemen	.....	73⅜
Machinists	69⅞	....
Night watchmen	57¼	....
Oilers and greasers, shovels	57⅜16	....
Pumpers	57⅜16	64¼
Shotfirers and shooters	59	64¾
Sledgers	57⅜16	....
Stripping-shovel engineers	*76⅜	83⅜
Cranemen	*66⅞	79¾
Firemen	*57½	77½
Oilers	.....	73⅜
Switchmen	57⅜16	64¼
Teamsters	.....	62½
Tipplemen	.....	62½
Tipple engineers	*61¼	....
Firemen	57¼	....
Trimmers	54⅛	....
Trackmen	57⅜16	62½
Tractor operators	.....	64¼
Tripriders	58⅜	64¼
Water boys or carriers	44⅞	62½
Welders	68⅞16	....
Other labor in pit	57⅜16	....

*Monthly scales: engineers, stripping shovel, $158.89; cranemen, $139.20; firemen, $119.51; tipple engineers, 26 days, $127.36.

CODE OPERATION

+ Lays New Economic Foundations

For Coal-Mining Industry

EVERY BRANCH of the solid-fuel industry joined the grand trek of American business to Washington in the summer and fall of 1933 to submit codes of fair competition to NRA, but only one coal code had been approved and was in operation when the year ended. That single exception, of course, was the Code of Fair Competition for the Bituminous Coal Industry, which became effective Oct. 2. Hearings were held in November on codes submitted by the anthracite producers and by the retail, wholesale and dock interests.

In the case of anthracite, actual submission of a code was delayed for several weeks while the producers sought to reconcile their own divergent viewpoints. When hearings finally were held, two of the larger producing companies —the Lehigh Valley and the Philadelphia & Reading—dissented to the price-control provisions of the code as filed and offered a substitute section. Organized labor, supported by spokesmen for affected communities, insisted that the code set up equalization of running time and curtail stripping, washing and culm-bank operations.

A revised code was submitted last month, but the revisions incorporated in the new version, according to William H. Davis, Deputy Administrator for NRA, failed to meet the major demands presented by labor at the November hearing. Mr. Davis made a number of suggestions designed to expedite agreement upon the points at issue (*Coal Age*, Vol. 39, p. 33.) and announcement was later made that conferences would be held with Gen. Hugh S. Johnson, National Recovery Administrator, early this month.

After quelling a rebellion within its own ranks by revising code draft definitions which, it was alleged, put the seal of approval on snowbirds and struggling with other code groups to reach a common ground on definitions of retailing and wholesaling functions, the code sponsored by the National Retail Coal Merchants' Association on behalf of retail dealers was condemned by General Johnson on the ground that the price provisions incorporated therein "were contrary to public policy and otherwise inestimable." This declaration, made in a letter dated Jan. 29, came after a drive by the retailers to compel action by NRA officials on the code, which had last been revised earlier in the month and was then understood to be in a form acceptable to the administration. Conferences, revisions and more conferences continued to delay approval of the wholesale and dock codes.

While redrafting and revision have been common to all coal code proceedings at Washington, except in the case of bituminous coal, each branch of the solid-fuel industry has been content to submit one code, or at the most two codes, to cover its activities. The dock interests, for example, originally filed separate codes for Atlantic Coast and for Northwestern docks, but these were later combined into a single code. Following the split on the question of a single code for the bituminous industry which developed at a meeting of operators in Chicago in June, 1933 (*Coal Age*, Vol. 38, p. 230), district code proposals became the order of the day.

By the time hearings opened at Washington on Aug. 9, nearly thirty separate codes and supplements had been filed with NRA. Only one of these proposed codes—that submitted by a group of union operators, principally in Illinois, and worked out in conference with officials of the United Mine Workers—was offered as a code to cover the bituminous industry as a whole. Indiana and Iowa producers, who had participated in some of the meetings on this code, parted company with their union brethren over the question of wages. Operators in Appanoose and Wayne counties, Iowa, declined to be parties to the code submitted by the Iowa association because they wanted a lower wage scale.

Northern and southern Appalachian producers joined forces in a separate code. Alabama commercial operators appeared with a demand that they be left to work out their own destiny through code machinery which would apply only to their state. Western Kentucky made a similar demand. Small-mine operators in Tennessee and Georgia asked special consideration, and Preston County, West Virginia, would have none of the Appalachian code. Southwestern producers not parties to the operator-union, or "general," code offered one of their own. Rocky Mountain states filed a master code for the region as a whole and separate supplements for each state or major operating division.

Southern Ohio, which had not joined its associates in the northern Appalachian field, also filed a separate code, but was willing to accept the operator-union code with slight modifications. Michigan also expressed a readiness to adopt the general code. Illinois wagon mines and a number of operators of non-mechanized mines who ship by railroad asked for differential wage preference at hand-loading mines. Operations shipping most of their output by truck protested against any code proposals which might be inimical to their development. The United Mine Workers wanted a 30-hour week.

Agreement on a single code for the soft-coal industry came only after sweltering weeks of compromise, conciliation, concession and pressure upon the spokesmen for the groups that had flocked to Washington fearful that imposition of any code upon their district other than the particular one they had formulated would rob them of cherished rights or privileges and would deny them autonomy in the conduct of their internal affairs. Unfortunately, the progress of conciliation and reconciliation of differences was unduly delayed by the failure of NRA to set up any machinery for inter-district discussion of these differences until mid-September.

In the form finally agreed upon and approved, the bituminous code (see *Coal Age*, Vol. 38, pp. 327, 350, for complete text) is among the most comprehensive adopted by any industry for the elimination of destructive trade prac-

tices, the establishment of price control and the orderly conduct of industrial relations. In respect to its marketing provisions and control, the nearest approach among the major heavy industries is in the codes for iron and steel, oil and lumber. In its provisions governing industrial relations, the bituminous code goes far beyond the other codes just named.

To meet the insistent demand for the fullest measure of autonomy in the conduct of the internal affairs of the industry, for code administrative purposes the country is divided into five major divisions, each with its separate divisional code authority. In addition, subdivisions and subdivisional code authorities have been established in the divisions covering large geographical areas or producing large percentages of the national output. Division I, for example, embraces seven subdisivions—Ohio, western Pennsylvania, central Pennsylvania, northern West Virginia, the Southern high-volatile fields, the Southern low-volatile fields and western Kentucky. Division II has separate subdivisions for Illinois, Indiana and Iowa. Division IV has two subdivisions—Kansas-Missouri-Oklahoma and Arkansas-Oklahoma. There are two subdivisions—northern Colorado and southern Colorado-New Mexico—in Division V.

The Presidential members of the divisional code authorities, four members designated by Division I, two by Division II and one each by Divisions III, IV and V and not to exceed three additional Presidential appointees, constitute the National Bituminous Coal Industrial Board. This board is subject to call from General Johnson and is empowered to consider and make recommendations to the divisional code authorities and to the President "as to any amendments to the code or other measures which may stabilize and improve the conditions of the industry and promote the public interest therein."

Specific recognition is given district selling agencies by empowering such agencies, when acting for producers "truly representative of at least two-thirds of the commercial tonnage of any coal district or group of districts," to initiate minimum prices for such district or districts. Where no such agencies exist, the duty of initiating minimum price schedules devolves upon the code authority for the division or subdivision. Subject to the approval of the Presidential member of the code authority and subsequent review by the National Recovery Administrator, prices so established must be observed as minima by the producers.

Controversies involving labor relations are handled first by local and district or divisional machinery and from there to divisional labor boards. Each divisional labor board consists of three members, one selected from nominations made by employers, one from nominations made by labor, and one, as impartial member, from nominations made by the divisional code authority. Two such boards have been established in Division I, one each in the other four divisions. Members of these six divisional boards constitute the National Bituminous Coal Labor Board. Only impartial members have the power to vote on a controversy, the other members acting in an advisory capacity. This national board may be called into action when (*a*) a controversy involves employers and employees of more than one division; (*b*) the decision of a divisional labor board affects operating conditions in more than one division, either directly or because of its effect upon competitive marketing, and (*c*) in the opinion of the Administrator, the decision of a divisional labor board involves the application of a policy affecting the general public or the welfare of the industry as a whole.

For the purpose of establishing the minimum wage standards required by the law, the code divides the bituminous region of the country into seventeen districts. These districts, designated by letter, are shown on the map, which also outlines the boundaries of the code divisional authorities. Two minimum rates were established for each of these districts—a minimum for inside skilled labor and a minimum for common outside labor. Where specific wage contracts were in existence at the time the code was promulgated, the minima set

Map of Code Authority Divisions and Wage-Rate Districts.

Presidential Members at Large of National Bituminous Coal Industrial Board

FRED E. BERQUIST, war veteran, former associate professor of industrial economics at Carnegie Tech.; in charge of the Decennial Census of Mines and Quarries; associate mineral economist, U. S. Bureau of Mines; mineral economist for NRA.

JOHN L. LEWIS, international president, United Mine Workers, who started at the face in Iowa and worked up into union ranks, advancing from statistician to head of the organization in 1919; member of the National Labor Board.

JAMES H. PIERCE, who brings the experience of 22 years in engineering and executive service in mining; helped Soviet Russia launch its coal program; formerly technical adviser on coal for NRA; consulting engineer and president, James H. Pierce & Co.

up in the code are the same as provided for in the wage agreements. The minima for those districts are set out in detail in the tabulation of present contract rates appearing on p. 65 of this issue of *Coal Age*. Minimum hourly rates in the districts not covered by that survey are:

	Inside Skilled	Outside Common
	Cents per Hour	
Western Kentucky (H)	50	37½
Alabama, Georgia and southern Tennessee* (J)	42½	30
Other southern Tennessee (J-1)§	48	35½
North and South Dakota ..	50	40

Letters in parentheses refer to districts shown in map on p. 70.
*Hamilton and Rhea counties.
§Marion, Grundy, Sequatchie, White, Van Buren, Warren and Bledsoe counties.

Base minimum rates of pay were established "with the understanding that other classifications of employment will maintain their customary differentials above or below said basic minimum rates and that payments for work performed on a tonnage or other piecework basis shall maintain their customary relationship to the payments on a time basis provided in said basic minimum rates." Except where otherwise provided by agreement, all coal mined on a tonnage basis must be paid for by the ton. Employees are authorized to employ check-weighmen and/or check-measurers. Wages due must be paid semi-monthly in lawful money or par check.

Living in company houses, except in the case of maintenance, supervisory men and others necessary to protect the property, and trading at company stores may not be made a condition of employment. In the absence of state laws naming a higher minimum, no person under seventeen may be employed underground or in hazardous work outside and no person under sixteen may be employed in any capacity in or about a mine. The code also provides a maximum work week of 40 hours and a maximum work day of 8 hours, except for certain specified small groups.

Although here and there an individual operator finds the details imposed upon him by the new machinery and the new labor relationships which have been established irksome, the verdict of the industry as a whole is distinctly favorable to the code. That the code has improved practices and competitive conditions is generally admitted, even in those districts where unusual circumstances have prevented the operators from enjoying any immediate financial benefits from the code set-up. Criticism of code operation and administration centers on three major points:

1. Failure to correlate intra- and inter-divisional prices.

2. Failure to police the thousands of small mines.

3. Failure to correlate coal, oil and gas prices upon a fair competitive basis.

The most pronounced price controversy which has arisen under the code involves Illinois and Indiana. At the start, each subdivision of Division II established prices independent of the other subdivisions. When the schedules were made public, it was found that Indiana, in an effort to hold markets competitive with Illinois, had set up a zone price basis and also had provided for the absorption of part of the freight rate on its coal into competitive areas. The zone idea and price differentials based upon use rather than size or quality also found limited favor in certain other divisions and subdivisions.

Threats by Illinois to further reduce its prices on screenings—promptly followed by threats of retaliation from Indiana—moved the Southern high-volatile group in Division I to protest to NRA that the Illinois-Indiana controversy endangered the price structure of competing divisions. Efforts of NRA officials at Washington to find a compromise basis which would be acceptable to the embattled Mid-Western producers came to naught. The Presidential member of Division II also found his persuasive endeavors fruitless. Peace was promised only after Washington ordered the two subdivisions immediately involved either to compose their differences or submit them to arbitration.

The apparent failure of NRA to come to grips with this situation until this recent peremptory demand has been widely criticized within the industry. Several cases of sudden withdrawal of approvals on schedules filed by various subdivisions and other shifts and reversals on price problems have not escaped censure. Defenders of NRA policies retort that it was the insistence of various coal groups last summer that no code would be acceptable which did not provide the fullest possible measure of local autonomy, and not inaction on the part of NRA, that is responsible for these critical situations.

While this defense is not without some justification, the long delay in naming the Presidential members of the division and subdivisional code authorities also played an important part. The code went into effect on Oct. 2, 1933, but the Presidential appointees were not announced until late in November and the personnel of the National Bituminous Coal Industrial Board was not completed until this month. Each subdivision dealt directly with Washington and NRA headquarters staff available to pass upon price questions was woefully limited and, in addition, already buried under a mass of other detail. As a result of these delays and the absence of Presidential code members to advise and counsel with the operators in the formative stages of price fixing, fluid ideas of

relative price bases had a tendency to harden into firm convictions which made the process of compromise increasingly difficult.

In order to prevent future intra-divisional price controversies, the code authority for Division I has recommended that each subdivision file its schedules not later than the twentieth of the month preceding their effective date with the division and also with the subdivisional code authorities within that particular division. If complaint is made against any proposed schedule and the affected subdivisions are unable to compose their differences within three days, the divisional code authority would be empowered, after hearing, to decide the issues by a majority vote. Its decision, however, would be subject to appeal to the Presidential member of the code authority and two Presidential members selected by him from the subdivisional code authorities, and their decision would be final.

This machinery for adjudication has been suggested "pending the establishment of a permanent, impartial board of arbitration." No specific proposals, however, have been advanced for the settlement of disputes involving two divisions. In the case of labor controversies involving two or more divisions, definite jurisdiction over such controversies is conferred upon the National Bituminous Coal Labor Board. Although the code gives the National Bituminous Coal Industrial Board a broad charter to advise and recommend on all matters affecting the welfare of the industry, handling of inter-divisional price controversies is not committed to its care. Presumably, if such disputes should arise, they would go directly to NRA for adjudication.

Prior to the upward movement in Appalachian wage rates which began last spring, less was heard of small-mine competition because basic wages in many of the major producing fields were at extremely low levels. As a result of the adoption of the code and the Appalachian wage agreement entered into at the same time, wage rates in districts which had been non-union were increased from 30 to as much, in some cases, according to union officials, as 200 per cent. Obviously, a mine paying a base rate of $3.40 to $4.60 or more per day for skilled inside labor and observing the other provisions of the code is at a distinct disadvantage in competing for business against a mine paying as low as $1 or $1.50 and working its men without regard to code limitations.

Because so many of these operations are so small that they do not enter into the ordinary statistical records, their existence must be discovered by scouts from divisional headquarters. In many cases the only way in which reports on these operations can be obtained is by personal visitation of one of these scouts. Effective control is further complicated by the fact that many, probably the majority, of these operations are engaged in purely intrastate business. Although they doubtless could be reached by federal processes of law on the ground that their non-observance of code requirements affects interstate commerce—a contention that has had the sanction of the U. S. Supreme Court in a number of cases, the government has elected to make its first test suits against small mines selling in interstate commerce. These cases have not yet come up for trial.

Early in the deliberations leading up to the promulgation of the code, spokesmen for the bituminous industry made it plain that soft-coal producers would be unable to pay the wage rates proposed and still retain existing markets unless something also was done to effect an upward adjustment of the prices on oil and gas and control hydro-electric development. An amendment was offered to the union-operator code providing for the creation of an inter-industry board to consider this question, but this proposal was ignored in the approved code.

It is only within the past few weeks that NRA has given any open consideration to this idea although, as C. E. Bockus, president, National Coal Association, declared in a recent letter to Miss Frances Perkins, Secretary of Labor, during the code hearings "the right of the industry to protection against such competition was generally recognized—and definitely acknowledged by Administrator Johnson and President Roosevelt." In the meantime, the industry has been compelled to wage its fight on other fronts. These have included a proposal for a federal tax on natural gas, appeal to the Petroleum Administrative Board, protest against the natural-gas code and attack on gas rates for the Chicago plant of Swift & Co.

At the meeting of the National Bituminous Coal Industrial Board at Washington last month, the question of government expenditures on projects which would displace coal and deprive thousands of miners of their livelihood came to a head. Open condemnation of specific proposals was softened down to a generalized plea that such projects should not be undertaken without full consideration of their ultimate social and economic effects, reading as follows:

> *"Be It Resolved* by the National Bituminous Coal Industrial Board that, in its opinion, a grave injury may result to the bituminous coal industry if the federal government, acting through its Public Works Administration and/or other agencies, persists in its present policy of loaning money directly or through private interests for the construction of numerous power-generating plants, transmission lines, dams, etc., without full consideration of the economic effect on this and other industries, and said Board suggests that the National Recovery Administration recommend to the President of the United States that these projects should be viewed in the light of the greatest permanent good to the largest number of our people."

Consideration of proposed projects for new developments on the basis suggested in this resolution, of course, would be one of the fundamental duties of the planning board now under discussion. But such a board, to be an effective agency, also would have to examine the problems of the competitive relationships now existing between already developed coal, oil, natural-gas and hydro-electric facilities to the end that no one source of energy could enjoy a competitive position which would undermine the wage security written into the code for a competing industry, since all the codes approved by fixing minimum wages and maximum hours definitely outlaw competitive campaigns financed out of wage slashing and hour stretching.

Any attempt at detailed evaluation of the financial effects of the operations of the Code of Fair Competition for the Bituminous Coal Industry at this time would be futile because the code has not been in effect long enough to establish a basis for such evaluation. Certain generalizations, however, are possible. There is general agreement that the code has laid the groundwork for stabilization of the industry on a sound economic basis. Complete realization of the hopes so raised will be dependent in a large measure on the success achieved in removing the grounds for criticisms of code administration discussed in preceding paragraphs.

That the position of labor in the industry has been materially improved and that the hourly earnings in districts which prior to Oct. 2, 1933, were non-union have been substantially increased are obvious. Full enjoyment of these benefits, however, must wait upon a greater demand for tonnage with steadier operating time. So, too, must any hope for a material increase in employment opportunities in the industry.

There has been much speculation on the question of possible shifts in tonnage between competing districts as the result of the leveling up of wages in the Appalachian fields. Here again it is too early to draw definite conclusions. The pattern is too confused by other factors to relate the changes shown to the effects of code operation. A backlog of contract business supports many districts; late summer storage, strikes and local conditions also enter the picture.

The real test of the code as it may affect interdistrict competition probably will come this spring when contract renewals are in full swing. The menace of the failure to coordinate price levels between coal and rival sources of energy will be clear when the industry as a whole surveys the business it has lost since the code became effective.

LETTERS

. . . to the Editor

No Disagreement Except—

The editorial on "Company Stores," in the December, 1933, issue, may be an unbiased opinion pointing out their advantages, and your statement that the independent retail associations are attempting to outlaw the use of scrip and curtail the credit-extension policies may be the actions of jealous competitors striking behind a screen of fair trade practices, but it is doubtful that these actions are "to connive at a flagrant perversion of the spirit of the act."

It is true the system, when properly directed, fills a definite economic and social need; however, you must agree that when this system is improperly directed it again fills an economic and social need—resulting in sufferings for the workers and unjust gains and practices for the operators.

Company stores should be divided into two major groups: those operated to fill an economic and social need at a fair profit and those whose unconscious objective evidently seems to be to obtain huge profit and to keep workers in a subjective state. There are many stores in each group. The stores falling in the first group are not detrimental to the independent retailers but those of the second group do not only deprive the competitors in near-by towns of a fair and just opportunity to make a living but they are the blood leechers who suck all the honey.

Why, you may ask, is this second class called blood leechers? If you do not know the answer it is because you were never compelled to trade in these stores, because you were never denied the delivery of goods purchased in an independent store, because you never became indebted to such a store and never had cash to buy elsewhere, because you never had to pay an excessive price for your flour, beans, etc., and last, but most important of all, because you never were deprived of the right to work because those indebted to the company through the store were given the preference, although you are an honest and thrifty worker.

This type of company store still exists and it is against this type that the barrage is being aimed by the independent retail associations.

DAVID ANDREW

Philadelphia, Pa.

[The editorial, as Mr. Andrew admits, plainly stated that "survival of the company-store system should rest solely upon" the basis that "the system, when properly directed, fills a definite economic and social need." But no such distinction is made in the proposed outlawing of scrip and curtailment of credit services by industrial stores in the suspended section of the Code of Fair Competition for the Retail Trade.]

Better Read the Code

This scribbling is intended to ascertain whether you are simply theorizing or just buttering your bread. In a fine, warm, cozy office in the Times Square neighborhood above the din of hurrying, toiling and frolicking multitudes, one is liable to lose himself in all forms of speculation.

However, anyone that cares to analyze your editorial, air it in the light of daily life-practice and hard reality, cannot help but condemn the company stores that exist as an arch enemy of the rural community and provincial life. You are evidently confusing an ideal, perfect company store (erected directly to make the miner's dollar go much further in satisfying his alimentary needs and indirectly create good will for the house) with the current offspring of greed, avarice, tendency to perpetuate a complete monopoly and abject serfdom.

We here in the Pocahontas coal fields, under the benevolent rule of —— Coal Co., can observe a different panorama, a different birdseye view on the transparent octopus stretching its tentacles to the four corners of the earth and its sides—its huge ugly body splurged upon perfect soil; its slanting eyes never perceiving that there is a heaven.

No sir! Coal business for the coal companies; store business for the merchants; light, power and water for the utility companies; rent and leases for the land companies or real estate man; diagnosing of the diseases for the doctor; compounding prescriptions for the pharmacist. Live and let live, but don't be a jellyfish fatalist to allow the company stores to take it all and annihilate prosperous communities that for generations have toiled and saved to build and maintain. Damn the company stores; they create nothing but misery and strife and discord.

Long live our venerable President, who saw clearly enough to divorce the coal miner from the cobwebs of company stores, company houses, company doctors and thousands of other devices which whittle down his pay.

West Virginia. PHARMACIST.

[While the frankness with which this critic admits the desire to wipe out the industrial-store system so that its competitors may enjoy a monopoly is commendable, NRA was not conceived as an instrument for the fulfillment of such a desire. Moreover, the implications of the panegyric to "our venerable President" are not supported by the facts, as the editors of *Coal Age* understand them, because there is nothing in the Code of Fair Competition for the Bituminous Coal Industry which denies the miner the privilege of living in company houses, patronizing company stores, employing company doctors or taking advantage of other community services which coal companies may provide.]

Wage Stabilization in Bituminous Industry Brings Union Back to Power

(Concluded from page 68)

scales will be published in the March *Coal Age*.

Basic inside day scales correspond to those prescribed in the bituminous code (October, 1933, *Coal Age*, p. 350-353), except in Colorado and New Mexico. The northern Colorado agreement fixes the basic inside rate at 65⅝c. per hour, against 62½c. in the code, while the southern Colorado-New Mexico agreement calls for a base rate of 58¾c., compared with the code rates of 55½c. and 56c., respectively.

Northern Colorado also deviated from the code in prescribing a basic rate for outside day labor of 53⅛c. per hour; code rate, 46⅞c. Basic rates of 41c. were prescribed in the code for the various Southwestern fields, while the Arkansas-Oklahoma agreement calls for 38⅞c. and the Kansas and Missouri agreements for 40⅞c. The Michigan contract set a base rate of 52¼c., against 45c. in the code, while the Washington agreement raised the code rate from 50c. to 51¼c.

Wage stabilization through code prescription and agreements leaves Alabama, Georgia, and Hamilton and Rhea counties in southern Tennessee in the lower bracket, with a basic code rate of 42½c. per hour for inside labor. Of the fields covered by agreements, the lowest base rate for inside labor (42½c.) in the latter two counties. Montant occupies the highest bracket, with a basic inside rate of 70⅜c.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

■

Power Requirements for Coal-Cutting Machines Influenced by Many Factors

EXPERIENCE in applying motors to coal-cutting machines and tests on similar machines in actual service constitute the best methods of determining the power requirements or rating of a motor required to drive a given machine. The speed of the cutter chain, type and number of bits, width of kerf cut, length of cutter bar, the setting of the bits and speed of feed are important factors in this determination, says I. H. Coen, general engineering department, Westinghouse Electric & Mfg. Co., and these variables must be coordinated to give the best cutting results for various seams of coal.

Table I compares the operating characteristics and duty cycles of the various types of cutting machines, the figures applying to average conditions and not to extremes sometimes encountered. Typical operating cycles for the machines under representative conditions are given in Table II. In listing the number of cuts per cycle in Table II, *H* designates a horizontal cut and *V* a vertical cut.

A representative day's work for a bottom-cutting machine consists of ten undercuts, each 24 ft. wide, making the total length cut 240 ft. At an average speed of 1.5 ft. per minute, the machine will be cutting approximately 160 minutes or 33⅓ per cent of the time. The rest will be spent in preparing to cut, transporting the machine, changing bits, oiling, etc. The fact that most cutting machines operate in a number of places and can actually cut coal only 25 to 60 per cent of the time assures an intermittent duty cycle, the motor operating under light-load conditions during movement of the machine at the face and while tramming from place to place.

Selection of the proper size of motor, therefore, requires consideration of the power required for cutting and other operations at the face and in running light, and the number and length of cuts which can be made by the machine. Average power consumption of a shortwall or longwall machine will vary from 30 to 60 watt-hours per square foot of coal undercut. Soft cutting will require about 30 watt-hours; medium cutting, approximately 40 watt-hours; and boney bands and high-sulphur coal, 50 to 60 watt-hours per square foot of undercut.

An approximate method of calculating the power requirements of the conventional type of cutting machine (motors rated on the one-hour basis) is given by the following empirical formula:

$$Hp = \frac{L \times S \times C \times 60}{746}, \text{ where}$$

L = Effective length of cutter bar in feet.

S = Cutting speed in feet per minute.

C = Power constant, the values of which, depending on the width of kerf cut, hardness of cutting, type of bits, chain speed, etc., are as follows: narrow kerf and easy cutting, 20; medium kerf and easy cutting, 30; average cutting conditions, 40; boney bands, sulphur and wide kerfs, 50 to 60.

Using this formula, a shortwall machine with a 6-ft. cutter bar and a cutting speed of 18 in. per minute, operating under average conditions, would require while cutting:

$$\frac{6 \times 1.5 \times 40 \times 60}{746} = 29 \text{ hp.}$$

A motor having a continuous rating at least as high as the root-mean-square (r.m.s.) rating should be used. R.m.s. horsepower is figured by squaring the horsepower values registered during the various parts of the operating cycle, multiplying the result in each case by the percentage of total time over which the values persisted and then extracting the square

Table I—Operating Characteristics and Duty Cycles for Various Types of Coal-Cutting Machines

	Shortwall	Longwall	Track-Mounted	Coal Saws	Breast Machines
Length of cutter bar, feet	5–9	3–6	7–12	5–7	4–7
Cutting speed, inches per minute	12–36	12–36	20–36	36–84	10–30
Width of kerf, inches	2½–6	2½–5	3–7	1¾–2½	2½–4
Approximate watt-hours per square foot undercut	40 ± 10	30 ± 10	30 ± 10	20 ± 10	30 ± 10
Estimated number of cuts per 8-hour shift	8–12	200–300*	10–30	4–12	4–8
Approximate tons per 8-hour shift	200	200	400	150	125
Horsepower, average cutting	33	28	37	33	15

*Feet per shift.

Table II—Representative Operating Cycles for Various Types of Cutting Machines

	Mounted		Shortwall	Longwall	Coal Saws	Breast Machines
	1H, 1V	2H	1H	1H	2H, 4V	6
Number of cuts per cycle	24.0	24.0	24.0	250.0	22.0	20.0
Width of place, feet						
Time Required for Various Operations, Minutes						
Tramming	5.3	5.8	8.0	0.0	5.5	8.0
Changing bits or saw chain	4.2	4.1	4.0	32.0	2.0	4.0
Preparing to cut	1.8	2.7	11.8	190.0*	8.5	20.0
Sumping and cutting	14.8	30.0	18.2	165.0	12.5	21.0
Preparing to shear	1.3	....	....	.....	9.5	00.0
Shearing	4.5	....	....	.....	12.5	00.0
Unavoidable delays	3.2	4.0	10.5	63.0	4.5	15.0
Total time	35.1	46.6	52.0	450.0	55.0	68.0
Cuts per 8-hour shift	13	10	9	1	8	6
Per cent spent in cutting	55.0	65.0	36.0	34.4	45.5	31.0

*Includes time for moving and setting props.

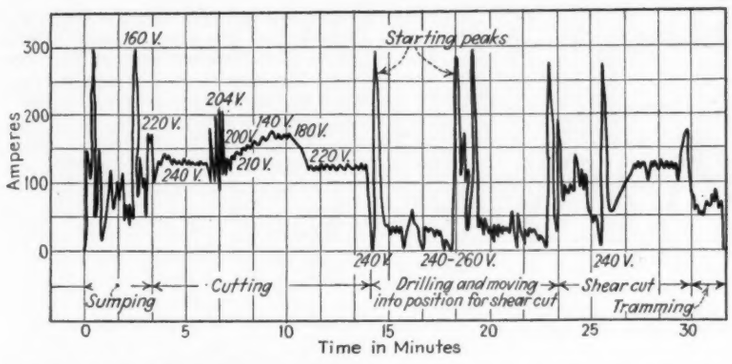


Fig. 1—Load Chart Showing the Current Taken by a 50-Hp., 210-Volt, 1,600-R.P.M. Motor Driving a Track-Type Cutting Machine With a 9-Ft. Cutter Bar, With Voltage Indicated at Various Loads; Calculated R.M.S. Current, 114 Amp. for 32½ Minutes

root of the sum. This results in a horsepower value indicating the net heating effect in the motor windings. Another way to calculate the r.m.s. value is as follows: square the horsepowers, multiply each by the actual time, divide the sum by the total time, and extract the square root of the quotient. With the assumed operating cycle given in Table III, the r.m.s. horsepower for the above shortwall machine would be 17.5. Cutting-machine motors usually are totally inclosed and rated on a one-hour basis. The one-hour rating of totally inclosed motors usually is from two to three times the continuous rating.

Operating cycles for four track-mounted machines are given in Table IV. The same problems encountered in applying motors to shortwall and longwall cutters are present in track-mounted applications. Tests on similar machines in actual service and a complete knowledge of the machine are the best guides in determining the power requirements of these types. Where more than one motor is used on a mounted machine, the main motor is operated only while cutting or preparing to cut. The auxiliary motor is chiefly a propelling motor, though it generally performs several other operations. The complete operating cycle, when the machine is equipped with a drill and adapted to shearing, usually consists of one cross cut, one vertical shearing cut and the drilling of four holes.

Friction load is inherently less with mounted machines, as they are not dragged along the floor. Therefore, the power constant will be about 20 per cent less than for shortwall or longwall machines. Using the formula offered above and assuming a power constant of 30 watt-hours on a machine with an effective length of cutter bar of 8.5 ft. and a cutting speed equivalent to 1.8 ft. per minute, the horsepower while cutting would be:

$$\frac{8.5 \times 1.8 \times 30 \times 60}{746} = 36 \text{ hp.}$$

For the duty cycle given in Column 4 of Table IV and the power requirements shown in Fig. 1 and Table V, the r.m.s. horsepower of this machine would be 25.4. Therefore, a motor having a continuous rating of 25 hp. should be used.

Motors for mounted machines usually are totally inclosed and rated on a one-hour basis, ratings for the main motor varying from 50 to 75 hp. on this basis and 20 to 35 hp. on the continuous basis. The propelling motor rating will depend on the weight of the machine, the speed of travel and the type and number of auxiliary operations performed. Series wound or heavily compounded motors having ratings of 7½ to 15 hp. on the one-hour basis are most generally used for this service.

Coal saws are a new type of machine designed to make a number of both horizontal and vertical cuts to enable the coal to be loaded without blasting. Two general classes of this equipment are offered: the floor type, which operates on the bottom in substantially the same manner as the shortwall cutter, and the track-mounted type, which operates in much the same manner as the track-mounted cutter.

Duty cycles for coal saws vary widely in accordance with the characteristics of the seam, the method of mining used, the size of coal desired, etc. The number of cuts made in each working place (usually two horizontal and three or more vertical) and the time required to move the machine into position result in an irregular and intermittent duty cycle. Fig. 2 shows a characteristic load chart for a complete cycle of two horizontal and three vertical cuts, while Table VI presents the data in tabulated form. On this basis, calculated r.m.s. horsepower is 20; therefore a motor having a continuous rating of 20 hp. should be used.

Electrical equipment suitable for opera-

1934 Ahead!

This issue, the Twenty-Third Annual Review and Progress Number of *Coal Age*, is devoted primarily to a review of economic and operating developments in the anthracite and bituminous industries in 1933. Last year apparently marked the turning point for coal, and a further expansion may confidently be expected in 1934. This, however, does not mean a relaxation of the pressure for economical and efficient operation. Practical operating, electrical, mechanical and safety men, therefore, must expect no decrease in the demand for money- and time-saving improvements, in which this department specializes. Your ideas also have a place here, and may be worth $5 or more each to you, if acceptable. Send them in. A sketch or photograph may help in making them clearer.

Table III—Duty Cycle and Calculation of R.M.S. Horsepower, Shortwall Machine Motor

	Horsepower	Per Cent of Total Time	— 2 Hp. x Time
Tramming	10	15	15.0
Changing bits	..	7	.....
Preparing to cut	12	22	31.7
Sumping	20	10	40.0
Cutting	29	26	218.0
Unavoidable delays	..	20	.....
Total	..*	100	304.7

*R.m.s. hp. = $\sqrt{304.7} = 17.5$

Table IV—Time Required for Various Operations With Four Types of Track-Mounted Cutting Machines

	Time in Minutes			
	No. 1	No. 2	No. 3	No. 4
Tramming	5.3	5.8	5.3	4.1
Changing bits	4.2	4.1	3.6	3.9
Preparing to cut	1.8	2.7	1.2	1.5
Horizontal cutting	14.8	30.0*	13.3	13.4
Preparing to shear	1.3	....	1.8	2.0
Shearing	4.5	....	4.5	4.5
Unavoidable delays	3.2	4.0	3.1	3.0
Drilling	....	....	6.4	8.5
Total	35.1	46.6	40.2	40.9
Per cent spent in cutting	55.0	65.0	45.0	44.0
Cuts per 8-hour shift	12.8	9.7	11.2	11.0
Oiling, minutes	30.0	25.0	30.0	30.0

*Two horizontal cuts in Freeport seam boney.

Table V—Duty Cycle and Calculation of R.M.S. Horsepower for Track-Mounted Machine

	Horsepower	Time in Minutes	— 2 Hp. x Time
Tramming	20	4.1	1,640
Changing bits	..	3.9	.....
Preparing to cut	22	1.5	725
Cutting	35	13.4	16,350
Preparing to shear	29	2.0	1,680
Shearing	35	4.5	5,500
Unavoidable delays	..	3.0	.....
Drilling	9	8.5	690
Total	..*	40.9	26,585

*R.m.s. hp. = $\sqrt{\frac{26,585}{40.9}} = 25.4$

Table VI—Duty Cycle and Calculation of R.M.S. Horsepower for Coal-Saw Motor

	Horsepower	Time in Minutes	— 2 Hp. x Time
Tramming	....	5.5	.....
Changing chain	....	2.0	.....
Preparing to cut	6.0	8.5	305
Cutting	31.0	12.5	12,000
Preparing to shear	7.0	9.5	465
Shearing	27.5	12.5	9,460
Unavoidable delays	....	4.5	.....
Total	...*	55.0	22,170

*R.m.s. hp. = $\sqrt{\frac{22,170}{55.0}} = 20.$

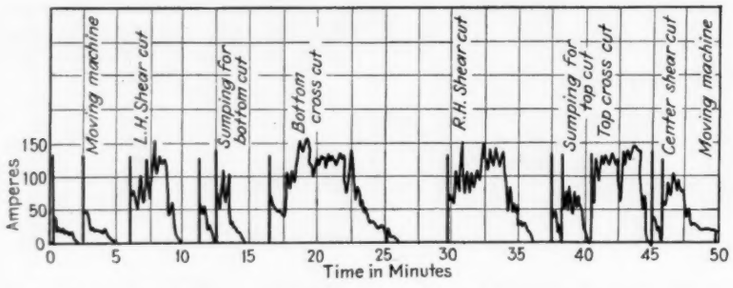


Fig. 2—Load Chart Showing Current Taken for a Complete Operating Cycle Under Hard Cutting Conditions; R.M.S. Current, 75 Amp.

tion on widely varying voltages and for handling high momentary peak loads is required for coal saws. Motors having a one-hour rating usually are supplied.

In view of the frequent starting under widely varying voltage and load conditions, magnetic controllers especially designed to carry high momentary peaks and to function under extremely wide voltage variations are furnished on coal saws. The propelling motor is a 7½- or 10-hp., one-hour-rated. heavily compounded type, and is used solely for this purpose; it is controlled by a reversing, drum-type controller. Coal saws have used motors equipped with drip-proof, semi-inclosing covers, which permit air to circulate through the motor and thus give a materially higher continuous rating than could be obtained with the same size totally inclosed motor.

Safe Blasting Practice

An item on "Safety Shotfiring Methods," summarizing some of the points brought out in U. S. Bureau of Mines Information Circular 6743, dealing with safety measures at the Columbia (Utah) mine of the Columbia Steel Co., a subsidiary of the United States Steel Corporation (*Coal Age*, November, 1933, p. 422), brings the following comments from Arthur LaMotte, manager, technical section, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.:

"While it undoubtedly is the correct practice to have the sensitive end of the detonator primer point toward the bulk of the [explosive] charge, there is a directional effect from the primer which makes it not always desirable to put the primer in the bottom of the hole and pointing toward the collar. Greater force is then exerted toward the stemming than toward the toe of the hole. In our demonstration work, we have found that a great many complaints of unexploded permissibles in the bottom of the hole are remedied by putting the primer with the sensitive end of the detonator pointing toward the bottom of the hole, the primer being loaded as the last or next to the last cartridge in the borehole.

"In the Safety in Mines Research Board Paper No. 69 of the Mining Department of Great Britain, it is found that with a given 'permitted' explosive with the detonator in the last cartridge —that is, pointing toward the bottom of the hole—no ignition in the gas-testing gallery was obtained with a charge of 24 oz., whereas with the same 'permitted' explosive and the detonator placed in the bottom and pointed toward the collar of the hole, 10-oz. charges caused ignition of gas. These authors state: 'The most striking result of the series of experiments is the great difference between the charge limit with direct and inverse firing, the latter being by far the more dangerous.'

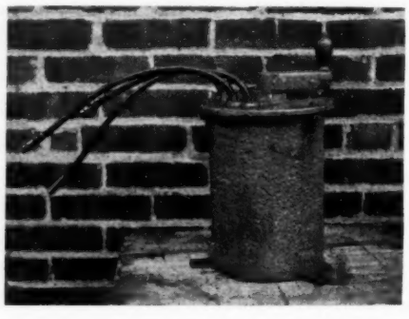
"We do not approve of the half hitch of the detonator wires around the cartridge, on account of the possibility, in firing with a strong current, of short circuits at this point. The safer method is to insert the detonator in the side of the cartridge, tie a string around the wires about ½ in. above the point of its insertion, and then tie the string firmly around the cartridge."

Oil Transfer Switches Developed For 550-Volt Service

At the Summerlee mine of the New River Co., Fayette County, W. Va., several mine locomotives have been equipped with oil-break drum-type transfer switches having an "Off" point. The object is to obviate arcing difficulties experienced in operating air-break switches on the 550-volt direct current used in the mine and to lessen the chance of shock and electric burns. A few mining machines have also been equipped with switches of this type in order to provide a means of safely cutting power off the machine in case of a short circuit or severe arcing in the wiring or equipment.

These drum switches, which were made in the central shop at Mt. Hope, have gone through several changes in design details, but the general form remains the same as an original built at Summerlee by mine electricians Z. L. Gordon (deceased) and W. H. Legg. In some of the recent switches the tank was made of 7-in. steel pipe. The pipe is cut 10¾ in. long and a steel plate bottom is welded into one end. Three lugs at the bottom for fastening the switch to the machine or locomotive are welded on the outside, as well as three lugs at the top for securely fastening the cover, which is set on with an oil-tight gasket. The cover is machined from a brass casting made in the company brass foundry. The handle is of the type which notches positively into the "Off" and operating positions. Drum and finger blocks are of maple, and the entire inside mechanism can be removed from the tank as a unit when the cover is lifted. A lining of heavy fish paper is put in the tank to discourage arcing to the steel wall. Leads, which are brought out through the cover in tight-fitting bushings of wood or fiber, have the insulation stripped from a section inside to stop oil siphoning.

Fig. 1—Shop View of Three-Lead Switch.



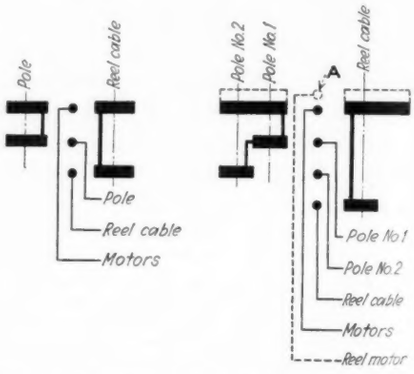


Fig. 2—Various Forms of Switch Provide for Three Classes of Duty.

In its simplest form the switch has but three leads and is designed for switching from pole to reel cable, and includes an "Off" position. The finger and drum arrangement is indicated at the left in Fig. 2. Mining-machine controller fingers are used in the construction.

Another form, shown by the full lines at the right in Fig. 2, has four leads and is designed for use on a cable-reel locomotive equipped with two trolley poles. Referring to the same sketch, but considering it as a whole, including the parts added by the dotted lines, there are five leads and the equipment then combines a reel motor switch. In this case, Finger *A* is moved into contact with, or out of contact with, the drum segment by a cam operated from a small auxiliary handle, the spindle of which is brought out through the cover about midway between center and outside edge of cover.

Although cases have been reported of unfavorable experience in breaking 550-volt d.c. arcs in oil, due to rapid carbonization of the oil, no trouble of this character has been observed at the New River mine. Some of the switches had been in use over a year at the time of this writing.

Short Rail Bond Made Standard At Large Mines

Because of the lower first cost and the several advantages of lower resistance, the short type electric-welded rail bond was tried in coal mines before 1920, but only recently has this type gained the status of widespread use. As an example, its use, after three years of trial, is now standard practice on main- and butt-entry tracks in all mines of the Island Creek Coal Co., Logan County, West Virginia.

Generally speaking, early attempts to use the short bond failed because of low standards of track and locomotive maintenance, resulting, respectively, in movement of the rail joints, which caused breakage of the conductor, and high false flanges on the wheels, which broke off the bond terminals welded to the side of the ball of the rail. Wrecks also played a part

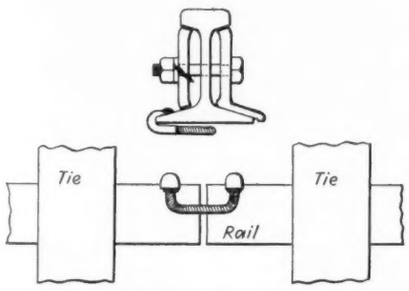


Fig. 1—Short Bond Installed on Splice-Bar Side of Rail. Lower Figure Shows the Bottom View.

in the destruction of bonds. Electrical men saw the advantage of the short bond, but failed at the time to persuade operating executives to change track and maintenance standards to accommodate the improved type.

The new practice is based on the use of a bond with the terminals welded to the top of the rail base and the strand lying underneath the rail in a protected position. Use of the short bond—a Type AW-18 with 9-in., 4/0 copper strand at Island Creek—requires certain changes in track construction. Instead of two angle bars per rail joint, one angle and one splice bar are employed, the latter being placed on the inside of the rail, thus leaving the base on this side exposed for attaching the bond terminals. Furthermore, the rail joint must be "suspended"—that is, there must be no tie under the center of the joint.

Besides the inherent low resistance of short bonds, a further advantage grows out of the fact that the bond is cooled by the absorption of heat into the rail. The resultant lower strand temperature allows higher current and reduces resistance. Experiments made by P. P. Pipes, rail-bond engineer, Ohio Brass Co., indicate the advantages which have brought about changes in track standards to accommodate the short bonds. From the curves in Fig. 2, it is evident that after a 400-amp. load has been imposed for 15 minutes, the temperature rise of a 7-in., 4/0 bond was but 88 deg. F., against 146 deg. in the case of a 36-in., 4/0 bond. Reference to the curves in Fig. 3 shows that the temperature rise is 200 deg. in the case of a 36-in., 4/0 bond carrying a current of 640 amp. for 30 minutes, while a 7-in., 4/0 bond will carry 1,420 amp. for 30 minutes with the same rise.

Test data on a group of bonds is set forth in Table I, which exemplifies the two chief advantages of short bonds—low joint resistance and high current-carrying capacity.

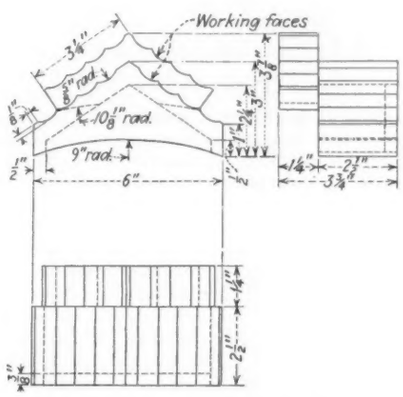
Table I—Test Data on a Group of Rail Bonds*

Bond Size	Length, Inches	Joint Resistance, Microhms	Amperes Required for Given Rise Above Rail Temperature 50°F.	100°F.	150°F.	200°F.
2/0	36	265	250	340	410	470
2/0	24	188	290	410	495	560
4/0	36	184	330	465	560	640
4/0	24	124	410	550	670	760
2/0	11½	88	480	665	800	905
4/0	11½	78	600	825	990	1,115
400,000†	46	99	600	840	980	1,090
2/0	7	72	600	845	1,000	1,105
250,000†	13½	58	700	950	1,130	1,280
4/0	7	53	770	1,080	1,265	1,420
400,000†	20	45	960	1,250	1,460	1,600

*Resistance measurements taken at 78 deg. F.; current value taken after 30 minutes' continuous operation.
†Circular mils.

Safety Block for Mine Cars

To prevent injuries due to the displacement of cap boards and similar blocking materials used in holding mine cars on a grade, the safety block shown in the accompanying illustration has been developed at the Zeigler No. 2 mine of the Bell & Zoller Coal & Mining Co., Zeigler, Ill. This block, described in a recent issue of the *Monthly Safetygram*, published by the company, is held firmly in place on the tread and flange of the wheel by a steel holding clip, thus eliminating the danger



Design of Cast-Steel Holding Block (Steel Holding Clip and Handle Omitted)

of accidental displacement inherent in the use of the usual type of stops picked up around the mine.

The main holding block is made of cast steel, to which a steel holding clip and handle are welded. Teeth are cast on both working faces to offer greater resistance to sliding, and these are casehardened to maintain their effectiveness. Projections on the block extend down, as shown, to hold the car on slide rails, the main part of the block coming into action when the

Fig. 2—Temperature Rise of Bonds Over Various Periods of Time Under a Load of 400 Amp.

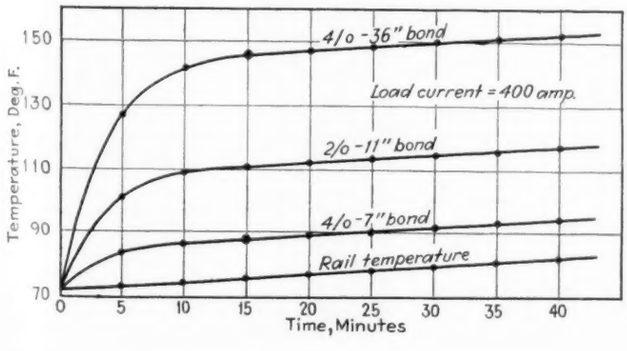
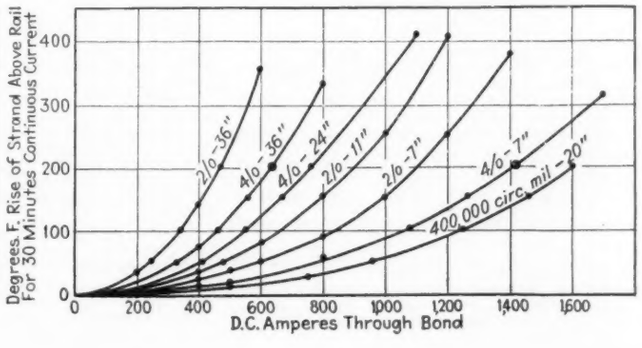
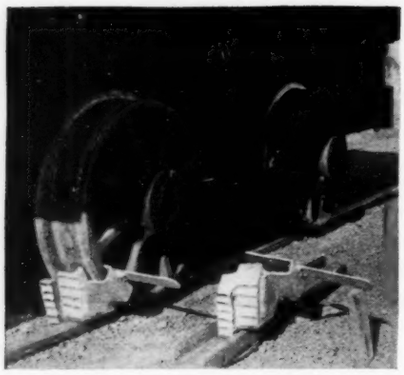


Fig. 3—Rise in Bond Temperature Over Rail Temperature at Various Currents Imposed for 30 Minutes.





Showing Use of Safety Block on Both Work-Way and Slide Rails

rail is in work-way position. The block is reversible for use on wheels moving in either direction.

Adequate Inspection Is Key To Proper Maintenance

There is a wide variation in standards governing frequency of inspections of mining equipment and items to be covered in such inspections. Recommendations of C. O. Gallagher, chief electrician of the Stanaford (W. Va.) mines of the Elkhorn Piney Coal Mining Co., a Koppers interest, indicate a progressive policy in equipment maintenance. In a paper read at a monthly meeting of the New River and Winding Gulf Electrical and Mechanical Institute, Mt. Hope, W. Va., Dec. 14, Mr. Gallagher set forth the following recommendations for weekly inspections and general overhauls of mining locomotives:

WEEKLY INSPECTION

1. Thoroughly clean locomotive with compressed air, or steam if available.
2. Motors—
   (a) Check condition of commutator.
   (b) Clean front V-rings, removing all dirt and grease.
   (c) Check brush holders for burning and sticking pressure fingers.
   (d) Inspect condition of brush-holder shunts.
   (e) Check brush-holder spring pressure.
   (f) See that brush-holder porcelains are clean.
   (g) If brushes will not last until next inspection, they should be replaced.
   (h) Inspect the brushes for tight and loose fit in the brush holder.
   (i) Look for loose brush-holder cable connections.
   (j) See that motors are equipped with gear cases and that all bolts are tight.
   (k) Examine the condition of gears and pinions.

By all means, check suspension bars and bolts daily, as suspension is the most hazardous factor in mine-locomotive operation.

3. Controllers—
   (a) Check controllers for undue heating of parts.
   (b) Inspect all leads and connections.
   (c) Inspect for damaged or burned arc deflectors.
   (d) File and adjust the fingers; clean segments.
   (e) Replace damaged or burned fingers and segments.
   (f) Lubricate segments with a little petroleum (amber).
   (g) Inspect condition of the blow-out coil.
   (h) See that the controller operates freely.
   (i) Remove all dirt and oil from inside the controller.
   (j) Lubricate the moving mechanism when the parts work stiff.
4. Resistance and cables—
   (a) Check for loose connections.
   (b) Inspect for broken or grounded grids or tubes.
   (c) All cable connections and terminals should be tight.
   (d) Inspect grids for signs of burning.
   (e) Remove accumulated dirt from the grids or tubes.
5. Headlights—
   (a) See that they are in good operating condition and that globes of the proper voltage are used.
6. Brakes—
   (a) Examine the brake shoes, cotterpins, bolts, nuts, brake hangers, and so on, and all brake connections.
   (b) Make all needed adjustments and replacements.
7. Sand Rigging—
   (a) Check sand rigging and see that it is in good operating condition.
   (b) Sand should run freely from each outlet and should strike the rail properly.
8. Journal boxes, springs and axle caps—
   (a) See that all bolts are tight and covers in place.
   (b) Inspect guides for proper lubrication.
   (c) Inspect journals and axles for lubrication.
   (d) See that there are no openings that would allow sand to enter.
9. Trolley wheels and cables—
   (a) Inspect trolley wheels, bushings and contact springs.
   (b) Examine pole head and harp.
   (c) See that trolley-pole cable and terminal block are in good operating condition.
10. Overload protection—
   (a) Examine ratings and settings of all protective devices on main, reel and blower motor circuits. Inspect all fuses, relays, thermostats, contactors, and circuit breakers, where overload protection is used with haulage or gathering equipments. Overload protection should by all means be used.
   (b) See that spare fuse links are on locomotive.
   (c) See that seals or padlocks are in use on relays, thermostats, circuit breakers, and other protective devices to prevent tampering with adjustments.
   (d) Any indication of abuse of equipment, bridging or alterations to the protective equipment should be reported to the chief electrician.
   (e) Examine all seals and padlocks on permissible and explosion tested equipment.

The Class A overhaul should be as follows:

1. Remove all equipment from the locomotive and completely overhaul the detailed parts.

2. Motors should be opened up and the field coils cleaned, tested and thoroughly painted with a good insulating varnish.

3. Armatures should be cleaned with compressed air and any other necessary means to bring megger readings up to standard, which has been adopted by some coal companies as 500,000 ohms. Armatures should be dipped in a suitable solvent, when necessary, to eliminate dust and grease. Armatures should be rebanded when necessary and dipped and baked. The front mica V-rings should be painted with Irvington No. 28 red protective paint or other suitable paint.

4. The millivolt drop on each field coil should be tested and recorded (any other equivalent test is acceptable). Fields having millivolt drop 10 per cent (or more) lower than standard should be repaired or replaced.

5. All badly worn motor bearings should be replaced and the brush holders put into first-class condition.

6. All detail parts of the controller should be put in first-class condition, and the inside carefully cleaned and painted.

7. All other electrical equipment should be cleaned up, overhauled and put in good operating condition.

8. The mechanical parts of the locomotive should be carefully checked and the worn or damaged parts repaired or replaced by new parts.

9. Wheels and axles, journal boxes and brake rigging should be put in A-1 condition before the equipment is reassembled on the locomotive.

10. Definite tests should be made with ammeters, thermometers and other necessary instruments to check the currents and temperatures at which the current and temperature limiting devices operate.

11. Definite tests should be made to make sure that the overload protective devices on gathering locomotives operate before fuse nips will blow. (This applies to equipment having protection on the cable circuit at the locomotive end.)

12. Megger readings should be taken on armatures, fields, wiring, controllers, control equipment and storage batteries. Records of megger readings should be kept. Parts having megger readings below standard should be cleaned, repaired or replaced so that readings will be up to standard.

13. The entire locomotive should be thoroughly cleaned and painted.

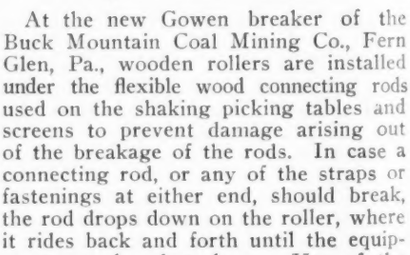
14. Standard grease valves and openings for grease overflow (from armature bearings) should be installed.

15. Loose riveted or bolted joints should be made tight. Hammer test should be made on rivets and bolts on main frame and on all other fastenings. (Rust at these joints indicates looseness.)

Broken Shaker Arms Held By Wooden Roller

At the new Gowen breaker of the Buck Mountain Coal Mining Co., Fern Glen, Pa., wooden rollers are installed under the flexible wood connecting rods used on the shaking picking tables and screens to prevent damage arising out of the breakage of the rods. In case a connecting rod, or any of the straps or fastenings at either end, should break, the rod drops down on the roller, where it rides back and forth until the equipment can be shut down. Use of the roller prevents the broken rod from dropping down onto the floor or any machinery which might be located under it, and also prevents damage to the equipment itself, or its drive, due to the sudden jamming of the rod against the floor or other obstruction.

Showing Wooden Roller Mounted Under Bull Shaker Connecting Rods at Gowen Breaker.



WORD from the FIELD

Coal Industry Presses War Against Substitutes

With natural gas and proposed hydro-electric power developments as its chief targets, coal last month intensified its efforts to secure some measure of relief from the inroads of substitutes. The plans of the bituminous industry for sponsoring a federal levy on natural-gas sales took definite form with the appointment of a committee of operators early in January to take charge of a bill imposing a tax of 5c. per M. Charles O'Neill, chairman, government relations committee, National Coal Association, and vice-president, Peale, Peacock & Kerr, Inc., was named as chairman.

At a joint meeting in New York on Jan. 29, the draft of the proposed measure was received from a committee of attorneys, and a supplementary committee of five operators, headed by Mr. O'Neill and including E. M. Douthat, Sinclair Coal Co.; J. D. Francis, vice-president, Island Creek Coal Co.; J. D. A. Morrow, Pittsburgh Coal Co.; and A. B. Steffens, Indiana & Illinois Coal Corporation, was named to present the measure to General Johnson, Administrator, and Donald Richberg, general counsel, NRA, on Feb. 13. The committee also assumed the task of conferring with Joseph B. Eastman, Federal Coordinator of Transportation, on Feb. 12 in relation to legislation placing natural-gas carriers under the jurisdiction of the Interstate Commerce Commission.

Representatives of Illinois operators and miners pressed their allegations of illegal and discriminatory practices by the Peoples Gas Light & Coke Co., distributing Texas natural gas in the Chicago district, at a hearing before the Illinois Commerce Commission on Jan. 10. W. J. Jenkins, president, Illinois Coal Operators' Association, testified that natural gas had been sold below cost to large industrial consumers and that this practice has resulted in a serious loss of tonnage with its attendant displacement of labor. His position was supported by Fox Hughes, United Mine Workers; A. B. Steffens, president, Indiana & Illinois Coal Corporation; and George J. Leahy, Binkley Coal Co. The gas company spokesman contended that the shrinkage in tonnage at Illinois shaft mines was due more to the growth of stripping than to low gas rates. The hearing was continued to Feb. 9.

Development of government-financed hydro-electric projects came in for a number of attacks in January. The Loup River power project at Columbus, Neb., which had been the subject of previous protests by operators and labor, was opposed in a resolution adopted by the National Bituminous Coal Industrial Board at its Washington meeting last month. This was reinforced by a general resolution against the use of government money for construction of power producing and distributing facilities without full consideration of their effect on coal and other industries. After a temporary decision to hold up the Loup River project, the Federal Emergency Administration of Public Works decided late in the month to go ahead with plans to supply the money. Operators estimate that operation of the project will cost coal 210,000 tons per year.

The St. Lawrence Seaway and its attendant power-producing aspects came under the fire of the industry and labor in January, featured by the adoption of a resolution by the Division I code authority protesting against ratification of the treaty now under consideration by the Senate. The proposed Missouri Valley Authority, similar to the Tennessee Valley Authority and fathered by Senator Norris of Nebraska, was the subject of a strong protest, late in January, by the Indiana code authority, which pointed out that the proposed hydro-electric plants would displace steam plants now consuming 4,000,000 tons per year and might eventually result in a total annual displacement of 30,000,000 tons of coal.

Two conferences on the possibility of establishing a Fuel and Energy Planning Board to study the question of competition between the various fuel and power industries took place in Washington in January under the sponsorship of NRA Deputy Administrator W. H. Davis. At the close of the second meeting it was voted that a committee of three be appointed to draft a definite plan covering: type of organization necessary, composition and duties of the planning board, source of the board's authority, and the nature of its contacts with interested parties.

Consolidated of Michigan Opening New Mine

The Consolidated Coal Co., Saginaw, Mich., is developing a new mine in Hazelton township, Shiawassee County, about 18 miles northwest of Flint. This operation, named the Crapo mine, is opened in the Upper Verne seam, ranging from 34 to 50 in., and will have a daily capacity of 1,000 to 1,200 tons. From 275 to 325 men will be employed.

Contracts already have been placed for all equipment. A new all-steel tipple is being erected by the Link-Belt Co., and 400 all-steel cars equipped with Timken bearings will be used. The Ottumwa Iron Works is building a 150-hp. electric hoist. Jeffrey 35B cutting machines will be used. Power equpiment includes two 150-kw. motor generator sets, and the mine will be completely electrified.

Lingle Heads Program Committee For Cincinnati Convention

C. M. Lingle, vice-president, Buckeye Coal Co., Nemacolin, Pa., has accepted the chairmanship of the national program committee for the eleventh annual convention and exposition of mining equipment, to be held under the auspices of the manufacturers' division of the American Mining Congress at Cincinnati, Ohio, May 7-11. Organization of the committee is already under way.

While no details of the program have been announced, it is probable that the relation of the bituminous code to practical operating problems will be featured at several of the technical sessions. As in the past, mechanization may be expected to have a large place on the program, with a number of papers on other phases of operation.

Because of the better industrial outlook, it is predicted that the exposition of mining machinery and equipment will make a new mark in convention history. Up to the first of the month, nearly 45 per cent of the floor space available for exhibition purposes had been contracted for. More exhibitors and larger exhibits of heavy equipment are promised.

To Push Dustless Coal

A radio campaign to make the household consumer more conscious of the advantages of dustless coal and coke has been launched by the Calcium Chloride Association. Weekly broadcasts have been started from five key cities—Detroit, Cleveland, Chicago, Cincinnati and Buffalo.

Coal Output Rises

Bituminous coal production in January, according to preliminary estimates by the U. S. Bureau of Mines, rose to 32,935,000 net tons. Production in December was 29,600,000 tons, while the output in January, 1933, totaled 27,060,000 tons. Anthracite output also rose to 6,127,000 tons in January, against 4,424,000 tons in December and 3,807,000 tons in January, 1933.

Anthracite Code Held Up

The proposed anthracite code went through another month of conferences between operators, miners and the NRA without a definite conclusion on differences being reached. The principal stumbling blocks continued to be equalization and the other demands of the United Mine Workers, though NRA opposition to the open-price provision included in the measure was reported to be an increasingly important factor in the delay.

Bituminous Board Discusses Code Problems; Indiana-Illinois Settlement Near

WITH rumblings of opposition against the price-fixing provisions of various codes, particularly the open-price system of the steel code and higher price levels on gasoline, growing louder in the background, the National Bituminous Coal Industrial Board held its first meeting in Washington last month to consider complaints of price-cutting from various regions, particularly Divisions I and II, as well as code compliance and enforcement in general.

While coal was not singled out for specific attack, consumer and Senatorial dissatisfaction with the alleged monopolistic and oppressive provisions of a number of codes, particularly from the standpoint of their effect on the small producer, was reflected in attacks in the Senate culminating in the passage, on Feb. 2, of the Borah resolution calling upon the Federal Trade Commission to study and report on price-fixing in the steel code and on increased gasoline prices. A previous resolution bearing on the same subject was offered by Senator Costigan, who requested that NRA submit a list of codes permitting price-fixing, as well as opinions filed at the hearings by spokesmen for the Consumers', Labor and Industrial advisory boards.

These moves, however, had been anticipated by the NRA, which began a series of hearings on consumers' grievances early in January. As a result of these hearings, Division Administrator Whiteside recommended a study of various plans of open-price reporting, and that machinery be set up for analyzing complaints or holding public hearings both from the economic standpoint and for obtaining possible information pointing to code revisions as well as for interpreting price behavior and comparing changes with variations in labor and material costs.

With representatives of the NRA, while admitting some errors of omission in code enforcement, pointing out that the task of administration was largely in the hands of the industry, the National Bituminous Coal Industrial Board began its sessions on Jan. 16. The major points at issue were reflected in the appointment of five committees to study the following questions: (1) inter-divisional code authority matters; (2) code enforcement; (3) increase of production and opening of new mines; (4) industry planning board and (5) price relations, zoning and freight rates.

The most important action of the week grew out of parallel sessions held by the Division I code authority. To halt the growing friction over price relations between subdivisions, the authority submitted to the various subdivisional authorities a plan designed to place the settlement of price controversies in the hands of the division authority pending the establishment of a permanent impartial board of arbitration.

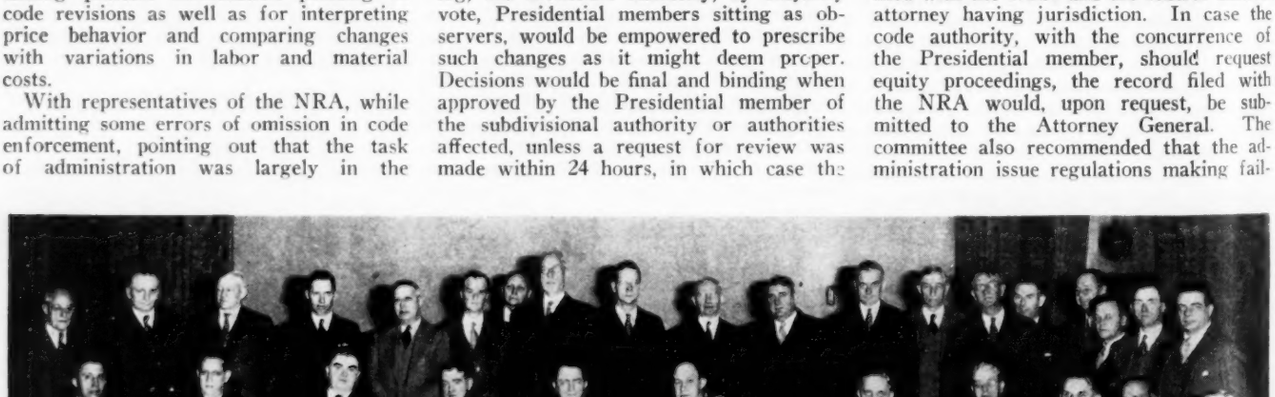
Under the terms of this plan, to become operative when approved by all the subdivisions, each subdivision of Division I would file, on or before the 20th of each month, a complete price schedule for the succeeding month, including terms and conditions of sale, with the divisional code authority and the secretaries of the subdivisional authorities. Three days would be allowed for filing objections with the divisional and other subdivisional authorities, in which case affected subdivisions would be allowed three days to compose differences.

Objections not composed as above would be referred to the divisional code authority meeting on the 26th of each month or succeeding day, in case of Sunday or holiday, for such purpose. After a hearing, the divisional authority, by majority vote, Presidential members sitting as observers, would be empowered to prescribe such changes as it might deem proper. Decisions would be final and binding when approved by the Presidential member of the subdivisional authority or authorities affected, unless a request for review was made within 24 hours, in which case the division Presidential member and the two others named by him would review the decision within 48 hours, their conclusions to be final and binding.

Division I also recommended to its subdivisional code authorities a resolution pointing out that the present surplus productive capacity prevents economic operation; that NRA as now constituted cannot cope with the problem of capacity reduction and new mines; that establishment of fair market prices and code operation have intensified this ill; and that the industry cannot maintain wages and working conditions prescribed in the code unless this condition is corrected, an action which rests only in the power of the government.

In view of the action of the Division I code authority, no report was rendered to the industrial board by the committee on "Increase of Production and Opening New Mines." The committees on "Inter-Divisional Code Authority Matters" and "Price Relations, Zoning and Freight Rates" were combined, but deferred presenting a report until after action on the Division I price settlement plan. Reports at the end of the month indicated that all of the subdivisions of Division I had registered approval, with modifications in some cases.

A plan providing for handling of complaints of violations by code authorities was submitted by the "Code Enforcement" committee. Under the terms of this plan, referred to the NRA legal department, all complaints would be filed with the proper divisional or subdivisional authorities, which would notify the accused operator and call a hearing. Findings and recommendations would be arrived at by a majority vote of the code authority members, and would have to have the approval of the Presidential member. In case of an operator being adjudged guilty, a complete record of the proceedings would be filed with the NRA and the federal district attorney having jurisdiction. In case the code authority, with the concurrence of the Presidential member, should request equity proceedings, the record filed with the NRA would, upon request, be submitted to the Attorney General. The committee also recommended that the administration issue regulations making fail-



Harris & Ewing Photo

The National Bituminous Coal Industrial Board Holds Its First Meeting

This picture, taken at the opening of the first meeting of the Board in Washington, D. C., Jan. 16, shows: seated, left to right, E. M. Douthat, Gilbert W. Gambrill, John L. Lewis, Wayne Ellis, K. M. Simpson, Donald Richberg, H. M. Poole, Frank L. Poindexter, James D. Francis, A. A. Liggett and Fred E. Berquist; standing, Arthur Vail, F. V. H. Collins, D. W. Buchanan, Robert E. Lemon, Jonas Waffle, M. Roberts, J. L. Rogers, Joseph Harrington, Fred K. Prosser, George B. Hadesty, Charles O'Neill, George J. Anderson, David C. Reay, Henry T. DeBardeleben, M. McIntyre, Benedict Crowell, Herbert S. Salmon, J. D. A. Morrow and William Emery, Jr. Messrs. Buchanan and Reay attended as alternates for George W. Reed and R. M. Hite, respectively. Messrs. Simpson, Richberg, Roberts and McIntyre attended as NRA representatives.

ure or refusal by any operator to pay pro-rata assessments for administrative expenses or supply statistical information a code violation.

A planning board to handle the problem of relationships between the various fuel and energy industries was recommended by the committee on "Industry Planning," which also offered resolutions indorsing the Thomason bill (H.R. 6143), which provides that Congress appropriate money to permit adjustment of prices by government departments parties to coal contracts to take care of the increased cost of code operation over and above the rise in labor cost, already provided for in the contracts; pointing out that grave injury may result from the present policy of the government in loaning money for hydro-electric plants without due consideration of the effects of these projects on coal and other industries; and urging the NRA to call the attention of the several code authorities to Art. XI of the coal code, which is as follows:

> This Code shall become effective on the second Monday following its approval by the President, and shall continue in effect until April 1, 1934, and thereafter in the absence of the exercise of the power reserved to the President in Art. X, subject to the exercise of the option, after 30 days' notice to the Administrator, by any coal producer to withdraw his consent after April 1, 1934, to the further enforcement of the Code as a Code to which he has voluntarily given his consent.

In this connection, the Dakotas Coal Code Association, on the ground that the authorities empowered to do so had failed to enforce the bituminous code, adopted a resolution in January to the effect that it would support the Division V code authority only from month to month, reserving the right to withdraw entirely upon 30 days' notice.

Final organization of the various administrative units under the bituminous code was assured by the appointment of three members at large to the National Bituminous Coal Industrial Board last month by President Roosevelt. These were (see p. 71 of this issue): Fred E. Berquist, John L. Lewis and James H. Pierce. H. C. Marchant, president, Pinnacle-Kemmerer Coal Co., Denver, Colo., was elected chairman of the Division V code authority at a meeting in that city on Feb. 1, succeeding F. V. H. Collins, resigned. L. T. Dee, vice-president, Lion Coal Corporation, Ogden, Utah, was named vice-chairman. Activities of the division were centralized at Denver. Washington, Utah, southern Wyoming and Montana were authorized to set up separate agencies under the code authority.

Changes in the western Pennsylvania subdivisional code authority last month resulted in the appointment of W. E. Valentine, sales manager, W. J. Rainey, Inc. (vice Scott Stewart); H. C. Burkett, Atlantic Crushed Coke Co. (vice F. M. Graff), and R. E. Sprankle, Butler Consolidated Coal Co. (vice Fred Stover).

Early February brought about a further postponement of the conference on results of code operation to Feb. 21. Like the previous date of Feb. 12, the latter is as yet tentative.

After nearly four months of wrangling over price differentials, intervention by the NRA on Jan. 22 brought peace between Illinois and Indiana in sight early in February. The action of the NRA took the form of demands for revision of price lists

A. F. Brosky
Appointed Assistant Fuel Adviser for Federal Surplus Relief Corporation

on the basis of the near agreement of last year (December *Coal Age*, pp. 428-429), elimination of freight-rate absorptions and zoning, and arbitration of the controversies between the two states and between Belleville and southern Illinois over differentials in the St. Louis market. The latter districts agreed to arbitration on Jan. 29, and Indiana and Illinois went into joint session at Division II headquarters in Chicago on Jan. 30. Deliberations resulted in both sides discarding arbitration in favor of direct negotiations. A tentative plan of settlement reached on Feb. 2 was approved by Illinois on Feb. 3.

Two additional mining operations were cited to the Department of Justice in January. These were the Riggen Coal Co., Harvey, Iowa (intrastate shipments), and Ballard Gearhart, Palisade, Colo. (chiefly intrastate shipments). In addition, the board cited the Bennett & Pulley mine, Promise City, Iowa, to the Federal Trade Commission for investigation into charges that the minimum price, maximum hour and minimum wage provisions of the code had been violated. Trial of the officers of the Moore Coal Co., Missouri, previously cited, was set for May, while officers of the Seals Bros. Mining Co., Iowa, were indicted on Jan. 20.

To Appeal Ohio Decision

Vacation of a temporary injunction restraining the Interstate Commerce Commission from compelling the Wheeling & Lake Erie R.R. to increase its intrastate rates on coal moving in Ohio will be appealed to the Supreme Court of the United States. The order of the Commission, requiring an increase of 29c. per ton on coal moving to Cleveland, with varying advances to other northeastern points, was enjoined on petition of the railroad and the State of Ohio last July. This order was vacated by the federal district court at Columbus early in January and the case set down for hearing on the cause on Jan. 19, when petitioners were granted a 60-day stay pending an appeal to the Supreme Court.

Ickes Widens Subsistence Plan; Congress Hits Program

Establishment of subsistence homestead projects at Birmingham, Ala., and in Mount Pleasant township, Westmoreland County, Pennsylvania, were announced by Secretary of the Interior Ickes in mid-January. In the Birmingham project, it is planned to select half the occupants of the homesteads from the "white-collar" class. The Westmoreland County project is expected to care for 200 to 300 families, including many miners.

Another phase of the rehabilitation program for unemployed miners ran into a snag in Congress on Jan. 26, when the House of Representatives amended the Treasury appropriation bill to prevent government purchases of equipment manufactured at any federal plant outside the District of Columbia. This was considered a direct blow at the furniture factory being built at Reedsville, W. Va., with public works money, and which planned to sell its output to the Postoffice Department. Opposition to purchases was made on the ground that the government should not be permitted to compete with private enterprise.

FERA Expands Fuel Set-up

A number of changes in handling orders placed by the Federal Emergency Relief Administration was announced by L. A. Snead, fuel adviser for the Federal Surplus Relief Corporation, last month. Replacement orders, except on dock and Rocky Mountain coal, will be handled direct from Washington instead of through the secretaries of the subdivisional code authorities. The latter, however, will receive copies of all orders placed in their territory.

J. A. Maher, manager, Maher Coal Bureau, St. Paul, Minn., was designated agent of FSRC for issuing replacement orders in dock territory. John R. Doolin, secretary of Division V code authority, Salt Lake City, Utah, functions in a similar capacity for the Rocky Mountain states. FSRC personnel in the coal division has been increased by the appointment of J. Harold Thompson, brother of former Federal Trade Commissioner Huston Thompson, as general assistant to Mr. Snead; J. B. Riefkin, formerly with the Bureau of Mines, as assistant fuel adviser in charge of New York and New England, and Alphonse F. Brosky, formerly associate and now consulting editor of *Coal Age*, as assistant fuel adviser in charge of Pennsylvania and Ohio territory.

Paul L. James, Chicago, was appointed fuel inspector for Illinois, Indiana, Wisconsin and Michigan; L. L. Miller, Princeton, W. Va., was placed in charge of inspection in West Virginia, Tennessee and Kentucky; and J. A. Stader, in charge of inspection in New York and New England. Replacement orders, which can be filled only by operators who have signified their compliance with NRA, are being issued at the rate of 25,000 to 30,000 tons per day.

On Jan. 29, Scott G. Lamb, Anthracite Institute, was appointed agent of the FSRC to supervise anthracite allotments by the corporation, vice Frank G. Frey, who recently resigned as acting director of the institute to join the M. A. Hanna Co.

Labor Board Decides Captive-Mine Row; Anthracite Strike Fades

LABOR DEVELOPMENTS in January were marked by a decision in the western Pennsylvania captive-mine dispute and an insurgent strike in the northern anthracite field. Action on the western Pennsylvania controversy followed hearings on Jan. 4 and 8. On the question of whether or not contracts should be made with union officials as individuals representing the men or as officials of the United Mine Workers, the board in its decision on Jan. 19 modified the proposal of the H. C. Frick Coke Co. and affiliates embodying the former principle, and also the proposal of the union for contracts between the company and the appropriate union district, offering the following formal clause:

Now, therefore, this agreement entered into this....day of....., 19.., between the said H. C. Frick Coke Co. and John L. Lewis, international president, United Mine Workers of America; Philip Murray, international vice-president, United Mine Workers of America; Thomas Kennedy, international secretary-treasurer, United Mine Workers of America; William Hynes, president, District No. 4, United Mine Workers of America; C. C. Boner, vice-president, District No. 4, United Mine Workers of America; and John Kurtz, organizer, District No. 4, United Mine Workers of America, representing the employees of the aforesaid coal company, who elected them as their representatives, and such other employees as may authorize them to represent them in negotiations with their employers, *Witnesseth,* it is agreed as follows:

The board declared that the question of whether or not a contract made in this form amounted to union recognition as a matter of law was not at issue before it, and therefore a decision was unnecessary.

In the matter of the check-off, the second major difference, the board declared that as a matter of fact the employees for whom the proposed contract was to be made were all members of the United Mine Workers. Consequently, it accepted the union's contention that the check-off clause in the District 4 and other agreements covering commercial operations should apply, but, in deference to the operators' contentions, added the proviso "that nothing in the foregoing shall be construed to deny to any employee not a member of the United Mine Workers the right to make voluntary assignments of his wages for dues or payments to any organization of which he may be a member, or for any other purpose."

By supplementary order, the findings in the Frick, National Mining and Sharon Coal & Limestone cases were applied in the Inland Collieries, Consumers Mining, Republic Steel, Allegheny Coal & Coke, Crucible Fuel, and Weirton, Shannopin and Vesta coal cases.

The Weirton company's Isabella mine, Republic, Pa., was the scene of a gun battle on Jan. 25, in which four miners and two deputy sheriffs were slightly injured, arising out of a strike staged on the same day in protest against the advancement of a miner to the position of foreman. Intervention by the National Labor Board resulted in a settlement of this and other difficulties, but a further demand for the removal of the superintendent extended the strike to Jan. 31.

The National Labor Board in January ordered elections in western Pennsylvania at the Searight mine, Republic Steel Co., and the Nemacolin mine, Buckeye Coal Co. Both operations were closed down when the general election was held in November.

Action of the National Labor Board in referring the insurgent union situation in the northern field to the Anthracite Board of Conciliation for investigation failed to halt a strike by the United Anthracite Miners of Pennsylvania on Jan. 15. With the exception of Luzerne County collieries, a few of which were forced to close down, the strike was relatively ineffective. Quick action by the Penn Anthracite, Hudson and Glen Alden companies in obtaining injunctions restraining picketing and interference reduced even these relatively small insurgent gains, with the result that while the strike order was technically in force and disorders at various points continued, conditions were close to normal at the end of the month.

Definite end of the strike appeared in prospect early in February through the selection of James A. Gorman, umpire for the conciliation board, as the sole arbiter under the procedure recommended by the labor board. Insurgents previously had objected to submitting their case to the full conciliation board, due to the fact that its membership is composed of operators and members of the United Mine Workers. The board on Jan. 26 announced that complaints against any company or labor organization would be received, and that "investigations and hearings with an impartial head" would start as soon as a sufficient number had been received.

Labor agencies set up by the bituminous code began to hit their stride in January. The National Bituminous Coal Labor Board decided not to assume jurisdiction over disputes where a definite method of settlement is provided in agreements. In response to widespread complaints of violations by "snowbirds" in northern Missouri, the board also urged immediate action by the Division IV labor board in cooperation with the appropriate subdivisional code authority and compliance board.

The board also approved the action of the Division II labor board in declaring, upon complaint by the Peabody Coal Co., that contracts with the United Mine Workers covering operation of Mines 47 and 43, Harrisburg, Ill., were valid and should be continued. In making this decision, handed down on Jan. 9, the divisional board rejected the claims of the Progressive Miners of America for jurisdiction, and refused an election to determine representation. The Progressives later appealed to the national board.

The Division II labor board also upheld a contract between the Progressives and operators of the Sahara and Wasson mines in Saline County, Illinois, providing for a reduction in wages in return for the abandonment of loading machines. In its decision (Jan. 15), the board reiterated its stand that it had no power to abrogate contracts entered into prior to NIRA.

Following a dynamite explosion and threats by Progressives at the Peabody No. 7 mine, Kincaid, Ill., Jan. 18, 200 deputies were rushed into the district to protect United Mine Workers and keep order. A strike at the Kings Station mine, Princeton Mining Co., Princeton, Ind., which began on Jan. 14 in protest against the dismissal of five employees convicted of rioting at Oakland City last September, ended late in the month when the strikers agreed to return.

One man was killed and another wounded in a clash between deputies and striking union sympathizers at the Henry Clay mine of the Edgewater Coal Co., Lookout, Ky., Jan. 29. Virtually full operation was reported on the following day. Differences between employees and the Fordson Coal Co. over union recognition and other questions resulted in the indefinite closing of the Twin Branch (W. Va.) operations of the company on Jan. 29, according to reports.

Associations

William Burlingham, vice-president, Hardy-Burlingham Mining Co., Newport, Ky., was elected president of the Hazard Coal Operators' Exchange at the annual meeting held last month. Other officers were chosen as follows: vice-president, George P. Fitz, general manager, Ajax Coal Co., Hazard, Ky.; secretary, C. B. Rose; and assistant secretary, Swift Parrish, Lexington, Ky.

T. C. Russell, general superintendent, coal mining department, Anaconda Copper Mining Co., Billings, Mont., has been re-elected president of the Montana Coal Operators' Association. E. C. Mattox, general manager, Roundup Coal Mining Co., Roundup, has been returned to the vice-presidency, and M. F. Purcell, Billings, again elected secretary.

Industrial Notes

J. D. CHRISTIAN ENGINEERS, San Francisco, Calif., have been licensed by the Falk Corporation, Milwaukee, Wis., to manufacture "Rite-Lo-Speed" motors under the original Christian design, Falk being the new owner of the patent.

ABBE ENGINEERING CO., New York, has appointed W. M. MCKEE, INC., Oliver Building, Pittsburgh, Pa., as its bituminous representative in western Pennsylvania and West Virginia.

JEFFREY MFG. CO., Columbus, Ohio, has opened a service station and warehouse at Beckley, W. Va., to serve the Virginia and southern West Virginia coal fields.

A. M. BYERS CO., Pittsburgh, Pa., has appointed J. B. DURKEE, formerly Tulsa (Okla.) representative, as manager of the Houston (Texas) office, succeeding H. B. WEATHERSBY, deceased.

MERGER of the AMBLER ASBESTOS SHINGLE & SHEATHING CO. and the KEASBEY & MATTISON CO., both of Ambler, Pa., and the acquisition of a controlling interest in the latter company by TURNER & NEWALL, LTD., Great Britain, was announced last month. The Keasbey & Mattison Co. name will be retained.

C. B. CROCKETT, former secretary of the Industrial Truck Association and a partner in the firm of Crockett, Lightner & Smith, engineers, New York, has joined the Cleveland Tractor Co., Cleveland, Ohio, as sales engineer.

Miners Reaffirm Stand on 30-Hour Week But Squelch Radical Wage Demands

REAFFIRMATION of the demand for a 30-hour week was made at the 33d biennial convention of the United Mine Workers, held at Indianapolis, Ind., Jan. 23-31. Delegates also gave the traditional authorization to the scale committee to make formal demand for increased wages at the next joint conference between operators and mine workers, but proposals for large flat advances received scant consideration. In keeping with the temperate note of the deliberations, John L. Lewis, international president, warned the 1,500 delegates present that they must not entertain too high hopes of early attainment of these objectives.

"The committee," he declared, "does not know whether our union in this year 1934 can achieve the objectives set forth." Since 44 years was required to win present widespread acceptance of collective bargaining, attainment of other advances by the mere waving of a magic wand is not to be expected. Millions of men are out of work and the national government is concerned with grave problems of economy. Union representatives, he promised, will approach the forthcoming wage conferences "in line with the promise that has been made by labor in America to the President of the United States, in a mood of cooperation, conciliation and constructive contribution to the well-being of the citizens of our great republic."

A shorter working week, stated the scale committee in the resolution adopted, offers the only possible constructive program for stabilization and more widespread employment. Restoration of prosperity to the mining industry and to the country as a whole "can come only through the medium of higher wage levels, which, of course, means increased purchasing power and a consequent increase in employment generally." All contracts negotiated should provide for union recognition and the check-off.

Enactment of NIRA and adoption of the bituminous code, continued the resolution, created new relationships and responsibilities for miners, operators and the federal government. Should the joint conferences with Appalachian producers fail to agree on hours, wages or working conditions, "then the solution of our difficulties naturally rests upon NRA."

Further evidence of the determination to temper jubilation over added strength through enactment of NIRA came when Mr. Lewis led opposition to a resolution offered by a Universal (Ind.) local alleging that mechanization had created widespread unemployment and calling upon the union to adopt some means to compel the gradual withdrawal of machinery from the mines. Percy Tetlow, on behalf of the resolutions committee, offered a substitute resolution which concluded:

> That, rather than object to mechanization of industry, we should devote our efforts toward the shorter work-day and work-week, toward a greater participation in the blessings of science, of progress, with the fundamental objectives of making mankind the masters of their destiny and subjecting machines, science and modern developments of industry to human-kind.

Protest against the substitute resolution was swept aside when Mr. Lewis took the floor. To attempt to scrap the things made possible by modern invention, he bluntly declared, would be "a false economic policy. Machines have made possible improvements in the standards of living to a point where it is impossible to scrap the means of advancement. What we must do is to see to it that we also share in the benefits wrought by the machines in the form of reduced working time and increased compensation."

For the first time on record, the National Coal Association was officially represented at the convention. The representative was Carroll B. Huntress, executive secretary, who addressed the delegates on Jan. 26 and urged continued cooperation of labor with management in fighting forces that threaten the security of the industry. By 1930, he pointed out, it was estimated that inroads of competitive fuels had cost the coal industry 200,000,000 tons annually, displacing 200,000 miners and a large number of railroad men and others employed in connection with the mining and distribution of coal.

To make matters still worse, continued Mr. Huntress, government policies are encouraging further development of competitive sources of energy which give small employment to labor. The RFC has loaned money to build pipe lines which jeopardize the jobs of miners in Colorado and New Mexico; the Navy is substituting more expensive oil for coal at Annapolis; PWA has authorized a loan to build a municipal oil-burning plant at Middlesboro, Ky., and is considering a similar loan for a plant at Carbondale, Ill. Hydro-electric developments fostered by federal money threaten the industry on every side: TVA is endangering the industry in the Tennessee valley; equally menacing projects are suggested for the Missouri and Arkansas valleys; PWA has authorized $7,300,000 for a plant at Loup River, Neb., displacing 200,000 tons of coal per year, and the proposed St. Lawrence seaway would further curtail coal consumption.

Reaction to this appeal for cooperation came on Jan. 29 when the convention adopted a resolution favoring the imposition of a federal tax on fuels competing with coal. The resolution proposed that the union officers petition Congress for such a tax on natural gas, fuel oil and on electricity generated by oil, gas or water power to promote fairer competition in the national energy markets. The proposed taxes would be absorbed by the producers of competitive energy.

High praise was given NIRA and the benefits accruing from the bituminous code in the joint report of the international officers submitted at the opening session. Later in the week the convention went on record as favoring the extension of the principles of NIRA beyond the expiration of the act in a resolution adopted as a substitute for proposals for taking over public utilities and basic industries by the government. "We believe," said the substitute resolution, "that the present plan of NIRA, which seeks to regulate and control public utilities and industry, is the best method of dealing with the problem."

Indianapolis Highlights

The 33d biennial convention of the United Mine Workers at Indianapolis last month:

(1) Reaffirmed support of the 30-hour week plan

(2) Urged higher wage levels for labor

(3) Condemned opposition to mechanization but demanded that labor share more fully in the benefits of the machine

(4) Favored continuation of NIRA program after 1935

(5) Proposed a federal tax on competing fuels

(6) Voted for "drastic action" to compel union recognition at captive mines

(7) Reaffirmed approval of old-age pensions and unemployment insurance

(8) Urged government control of coal mining

(9) Voted to remove the international headquarters of the union to Washington, D. C.

(10) Condemned dual union movements.

Personal Notes

A. COATS, formerly superintendent of the Labuco (Ala.) mine of the Birmingham-Trussville Iron Co., has been promoted to superintendent of the Labuco coal mining division of the company, vice the late Lafayette F. Bryson, who died Jan. 3.

R. S. EVANS, superintendent, Dorrance colliery, Lehigh Valley Coal Co., Wilkes-Barre, Pa., was the recipient of a testimonial dinner given by colliery employees on Jan. 6 in honor of his retirement after nearly a half a century of service in the industry.

FRANK G. FREY, acting director of the Anthracite Institute, resigned last month to become sales promotion manager for the M. A. Hanna Co., with headquarters at Philadelphia, Pa.

CHARLES GOTTSCHALK, formerly vice-president in charge of operations of the Big Vein Coal Co., Buckskin, Ind., has been made secretary of the Tri-State Coal Trade Association, with headquarters at Cincinnati, Ohio. The organization represents operators in Indiana, Kentucky and Tennessee.

L. C. GUNTER, executive vice-president, Southern Appalachian Coal Operators' Association, was elected a director of the Smokeless and Appalachian Coal Association at a meeting in Washington, D. C., Jan. 19, vice E. C. Mahan, president, Southern Coal & Coke Co., resigned.

FRED LEGG, manager of the Cincinnati (Ohio) office of the Old Ben Coal Corporation, has been elected president of the Central Frog & Switch Co.

D. D. MUIR, JR., vice-president and general manager, United States Fuel Co., Salt Lake City, Utah, has been elected president of the Utah State Board of Trade, organized last month to build up Utah's industry and commerce and act as a clear-

ing house in the solution of problems connected with enforcement of codes of fair practice.

JOHN F. MACKLIN, Philadelphia, Pa., president, Monroe Coal Mining Co., was elected a director of the National Coal Association in January, succeeding the late J. W. Searles, president, Pennsylvania Coal & Coke Corporation.

JAMES MCSHERRY, formerly vice-president and part owner of the Perfection Coal Co., Duquoin, Ill., has been appointed director of the Illinois Department of Mines and Minerals, vice John G. Millhouse, who has announced his candidacy for Congress.

P. R. PAULICK, formerly time-study engineer for Hanna Coal Co., is now on the engineering staff of the Pittsburgh Terminal Coal Corporation, Pittsburgh, Pa.

MARK W. POTTER, formerly a member of the Interstate Commerce Commission, was elected chairman of the board of the Pennsylvania Coal & Coke Corporation, New York, in January.

DON ROSE, general counsel, Pittsburgh Coal Co., has been elected a member of the board of directors to fill the vacancy caused by the death of R. B. Mellon.

ALAN M. SCAIFE has been elected chairman of the board of directors, Pittsburgh Coal Co., vice W. G. Warden, resigned. Mr. Scaife is a son-in-law of the late R. B. Mellon.

A. M. Riddle Dies

Andrew M. Riddle, superintendent of the Frederick mine of the Colorado Fuel & Iron Co., Valdez, Colo., since 1922, died at a Pueblo hospital, Jan. 22, of general septicemia. Born at Sharon, Pa., in 1873, Mr. Riddle got his first mining experience at the age of 10 in the Rock Springs (Wyo.) field. He later went to work for the Fuel & Iron Co. in southern Colorado, and in 1900 suffered a broken back in a cave-in in the Engle mine. While he never recovered from the resultant paralysis of his legs, he refused to give up his mining career, working as a telegrapher and clerk at many of the company's operations. His record and familiarity with underground operations dictated his appointment as acting superintendent of the Frederick mine in 1922, quickly followed by his elevation to superintendent.

Coming Meetings

American Institute of Mining and Metallurgical Engineers; annual meeting, Feb. 19-22, 29 West 39th St., New York City.

Rocky Mountain Coal Mining Institute; annual meeting, Feb. 26-28, Denver, Colo.

Mine Inspectors' Institute of America; twenty-fifth annual convention, May 7-9, Brown Hotel, Louisville, Ky.

American Mining Congress; annual convention and exposition, May 7-12, Cincinnati, Ohio.

Canadian Institute of Mining and Metallurgy; thirty-fifth annual meeting, April 3-5, Quebec City, Canada.

Permissible Plates Issued

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in December, as follows:

(1) Goodman Mfg. Co.; Type E-10-82 shaker conveyor; 10-hp. motor, 440 volts, a.c.; Approval 262A; Dec. 8.

(2) Jeffrey Mfg. Co.; inclosed, 3-pole, automatic air-break circuit breaker, Type CB-100-13; 110 amp., 440 volts, a.c.; Approval 405A; Dec. 4.

Record Low Fatality Rate Marked up in 1933

With preliminary reports showing a total of 1,013 fatalities at anthracite and bituminous mines in the United States in 1933, the combined fatality rate, based on an estimated output of 377,339,000 tons, dropped to 2.68 per million tons—the lowest rate on record in the history of mining in this country, according to statistics compiled by the U. S. Bureau of Mines. While injuries that had not yet proved fatal at the end of the year are expected to raise the rate to approximately 2.83 per million tons, the record will still be the best ever established. One outstanding factor in the establishment of this rate was the fact that only one major disaster occurred in the past year.

In December, coal-mine accidents caused the deaths of 69 bituminous and 21 anthracite miners, according to information furnished the bureau by state mine inspectors. This compares with 53 bituminous and 29 anthracite fatalities in November. Based on a production of 29,600,000 tons, the bituminous death rate was 2.33 per million tons in December, against 1.73 in November, when the output was 30,582,000 tons. The anthracite death rate dropped from 6.03 in November, when 4,811,000 tons was mined, to 4.75 in December, when the output was 4,424,000 tons. For the two industries combined, the December death rate was 2.65, against 2.32 in November.

Comparative fatality rates for the years 1933 and 1932, by causes, are as follows:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

Cause	1932 Bituminous Number killed	1932 Bituminous Killed per million tons	1932 Anthracite Number killed	1932 Anthracite Killed per million tons	1932 Total Number killed	1932 Total Killed per million tons
Falls of roof and coal	465	1.501	154	3.089	619	1.722
Haulage	147	.475	33	.662	180	.500
Gas or dust explosions:						
Local explosions	17	.055	7	.140	24	.067
Major explosions	145	.468	...	....	145	.403
Explosives	21	.068	15	.301	36	.100
Electricity	42	.136	5	.100	47	.131
Machinery	27	.087	1	.020	28	.078
Surface and miscellaneous	94	.303	34	.682	128	.356
Total	958	3.093	249	4.994	1,207	3.357
	1933 Bituminous Number killed	1933 Bituminous Killed per million tons	1933 Anthracite Number killed	1933 Anthracite Killed per million tons	1933 Total Number killed	1933 Total Killed per million tons
Falls of roof and coal	447	1.363	124	2.510	571	1.513
Haulage	158	.482	30	.607	188	.498
Gas or dust explosions:						
Local explosions	19	.058	13	.263	32	.085
Major explosions	7	.021	...	....	7	.018
Explosives	18	.055	10	.202	28	.074
Electricity	48	.146	7	.142	55	.146
Machinery	14	.043	2	.041	16	.043
Surface and miscellaneous	71	.217	45	.911	116	.308
Total	782	2.385	231	4.676	1,013	2.685

*Figures for 1933 are preliminary and subject to rev ision.

B. M. Clark Dies

Benjamin M. Clark, chairman of the board of directors, Rochester & Pittsburgh Coal Co., died at his home in Indiana, Pa., Jan. 21. Mr. Clark, who was born in Brookville, Pa., in 1865, devoted the early years of his career to the practice of law and it was that profession which brought him into the coal industry in 1902 when he was made general solicitor for the Rochester & Pittsburgh Coal & Iron Co. and the Jefferson Coal Co. He was elected vice-president of these companies in 1917 and became president two years later. He became chairman of the board last year. Mr. Clark, an active leader in association work, was also president of the Central Pennsylvania Coal Producers' Association and a director of the National Coal Association.

Fire Sweeps Colorado Tipple

Fire of undetermined origin practically destroyed the tipple of the Puritan mine of the National Fuel Co., near Frederick, Colo., and badly damaged other topworks structures on Jan. 9. Part of the shaft also caved in when the fire ate away the timbering.

Take Over MacLean Operation

Control of the mine of the MacLean Coal Co. at Rains, Utah, has been purchased by Charles T. Worley and Dr. Foster J. Curtis, of Salt Lake City. The consideration involved was reported to be in excess of $200,000.

Obituary

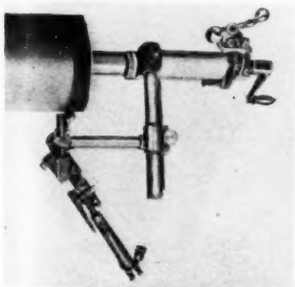
JOHN CONRAD PACK, vice-president and general manager, Buckeye Coal & Coke Co., Bramwell, W. Va., and a pioneer operator in the Pocahontas field, died at St. Petersburg, Fla., Jan. 26.

WILLIAM WEBB CRAWFORD, 66, director, Sloss-Sheffield Steel & Iron Co. and the Bessemer Coal, Iron & Land Co., and long prominent in the industrial life of the Birmingham district, passed away at Birmingham, Ala., Jan. 15.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Welding Equipment; Gas Indicator

Linde Air Products Co., New York, has added the "Oxweld" pipe-cutting and beveling machine to its line of cutting equipment. It consists esentially of a center rod with three spreading arms which press against the inner wall of the pipe to hold the cutter in position, and an arm supporting a blowpipe which is adjustable to the desired cutting angle. Blowpipe and arm rotate without the use of a crank for quick centering, and by means of a crank during the actual cutting operation. The machine, according to the company, will take almost any hand-cutting blowpipe, is readily portable and simple to operate. It

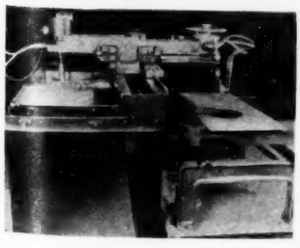


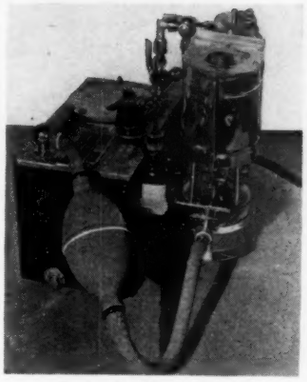
Pipe-Cutting and Beveling Machine.

finds its greatest application where large quantities of pipe are to be cut and beveled.

Linde Air Products also offers the "Pantosec," a stationary precision shape-cutting instrument for cutting dies, cams and other parts which must be smoothly and accurately cut. With a cutting range of 44 in. longitudinally and 20 in. laterally, the machine, according to the company, does straight-line,

Oxweld "Pantosec."





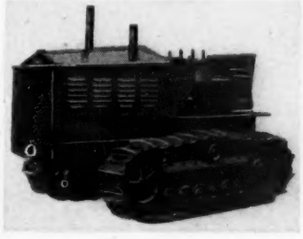
U.C.C. All-Service Gas Indicator.

angle, circle and intricate-shape cutting, and beveling. Floor space required is 72x83 in.

Another new product offered by the Linde company is the U.C.C. all-service gas indicator, supplementing the U.C.C. methane detector and the U.C.C. combustible gas indicator. While designed primarily for the manufactured-gas industry, the company points out that it may be of equal service in others. The detector, it is asserted, performs three functions: Indicates how flammable or explosive an atmosphere is; shows the presence of poisonous gases and vapors; and indicates any deficiency of oxygen.

Diesel Tractor

Cleveland Tractor Co., Cleveland, Ohio, offers the "Cletrac Diesel 80" crawler tractor. In the 80-hp. class, this tractor, it is stated, de-

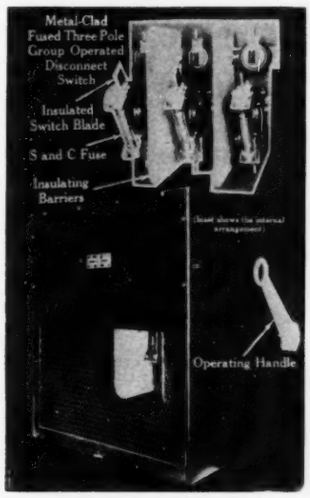


velops 85 hp. in second gear, and exerts a pull of 19,000 lb. at 1.7 m.p.h. Other than the engine, specifications are the same as for the gasoline-powered "Cletrac 80." According to the company, the heavy weight, which has been one of the objectionable features of the diesel engine, has been largely overcome in the Cletrac diesel. In addition, the company points to starting equipment, which, it declares, makes starting as easy as with a gasoline engine.

Switches

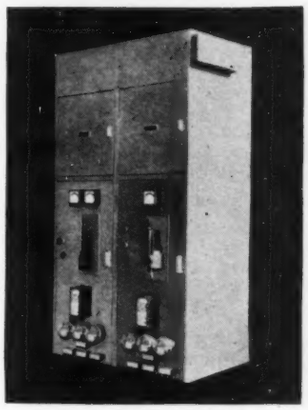
Delta-Star Electric Co., Chicago, offers a new metal-clad switch for service up to 15 kv., said to be a safe, convenient and easily installed three-pole group-operated switch for industrial service. The three switch blades carrying fuses are interlocked and are simultaneously opened and closed by a locking-type external handle. A screened opening is said to permit easy inspection of fuses and adequate ventilation. Above the screen opening is a panel which can easily be removed for replacement of fuses.

Delta-Star also has developed a line of standardized 7.5-kv.



Metal-Clad Fused Switch

steel-inclosed cubicles for assembly in any desired number of units. The manual, solenoid or motor-operated oil circuit breakers are trip-free and the operating mechanism interlocks with the hinged door of the disconnecting switch compartment. The bus is located at the top of the compartment, which is provided with removable end covers

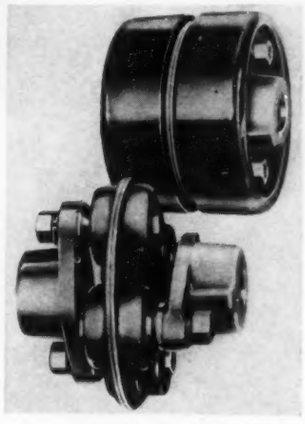


Steel-Inclosed Cubicles

to permit easy connection to added units. The left cubicle in the illustration is an incoming line unit; the right, a feeder unit. Relays, meters, instruments and control switches are attached to the hinged doors for easy access to wiring and control leads.

Flexible Coupling

Morse Chain Co., Ithaca, N. Y., a division of the Borg-Warner Corporation, announces a new flexible coupling—the "Morflex." The flexing member, according to the company, is a complete unit comprising four molded non-cold-flow rubber trunnion blocks spaced 90 deg. apart and set under pressure into a two-piece riveted steel housing. The trunnion blocks are provided with steel bushings also set into the blocks under pressure. Two diametrically



opposite blocks are bolted to the steel driving and driven flanges, respectively, which are mounted on the shafts to be connected. Thus, it is declared, all metal parts are rigid and all relative motion is confined to the rubber. Also, there is no metal contact between flanges and no movement between the rubber and metal, all flexing taking place in the former. Shocks and uneven impulses, says the company, are absorbed, sudden reversal can take place without damage, and the coupling transmits all power at maximum misalignment. Lubrication or protection from air, dirt or fluids is not necessary.

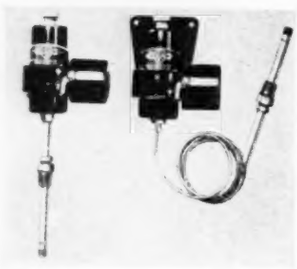
Methylene Blue

As a result of medical experience showing the value of methylene blue in conjunction with artificial respiration in the treatment of carbon - monoxide poisoning, E. D. Bullard Co., San Francisco, Calif., offers a methylene blue emergency package containing everything necessary for instant treatment by a physician.

Bearing Thermostats

For preventing stoppages due to overheated bearings, Electric Controller & Mfg. Co., Cleveland, Ohio, has developed the EC&M bearing thermostat, consisting of a sealed metallic bulb containing a volatile liquid, which is connected directly or through flexible copper tubing to a one-piece seamless metal bellows operating quick-make, quick-break contacts. As the bearing temperature rises, the volatile liquid expands, raising the pressure in the bulb. This pressure is transmitted to the bellows, which opens the contacts and shuts down the machine. The thermostats are shipped to operate at 100 deg. C., and can be adjusted in the field to 15 per cent above or below this value. Bulb or relay may be installed in any position.

Left, Thermostat With Direct-Connected Bulb; Right, Standard Type With Capillary Tube and Bulb



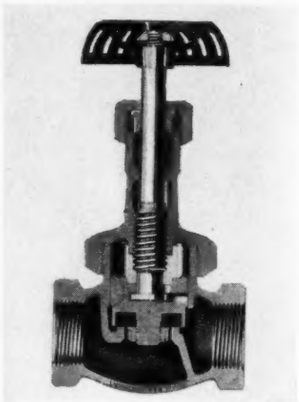
Diesel Locomotive

Whitcomb Locomotive Co., Rochelle, Ill., subsidiary of the Baldwin Locomotive Works, announces a new 12-ton 0-4-0 diesel locomotive with mechanical drive, which

it declares will start 390 trailing tons on the level with sanded rail or 290 tons on a clean, dry rail. It will haul 324 trailing tons up to 10.82 m.p.h., 190 tons up to 16.87 m.p.h., and can be built on any track gage from 30 in up. Power is supplied by a 6-cylinder full-diesel engine rated at 85 net hp. at 1,200 r.p.m.

Non-Metallic Disk Valve

Lunkenheimer Co., Cincinnati, Ohio, offers the new Fig. 123 "N.M.D." non - metallic - disk bronze valve for the following pressures: steam, 150 lb.; gases or liquids, 300 lb. Strength, ease of operation and positive action are stressed by the company, which states that the valve can be repacked under pressure. It is available in globe angle, horizontal and angle check, spring check for compressor service and quick-operating types.



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